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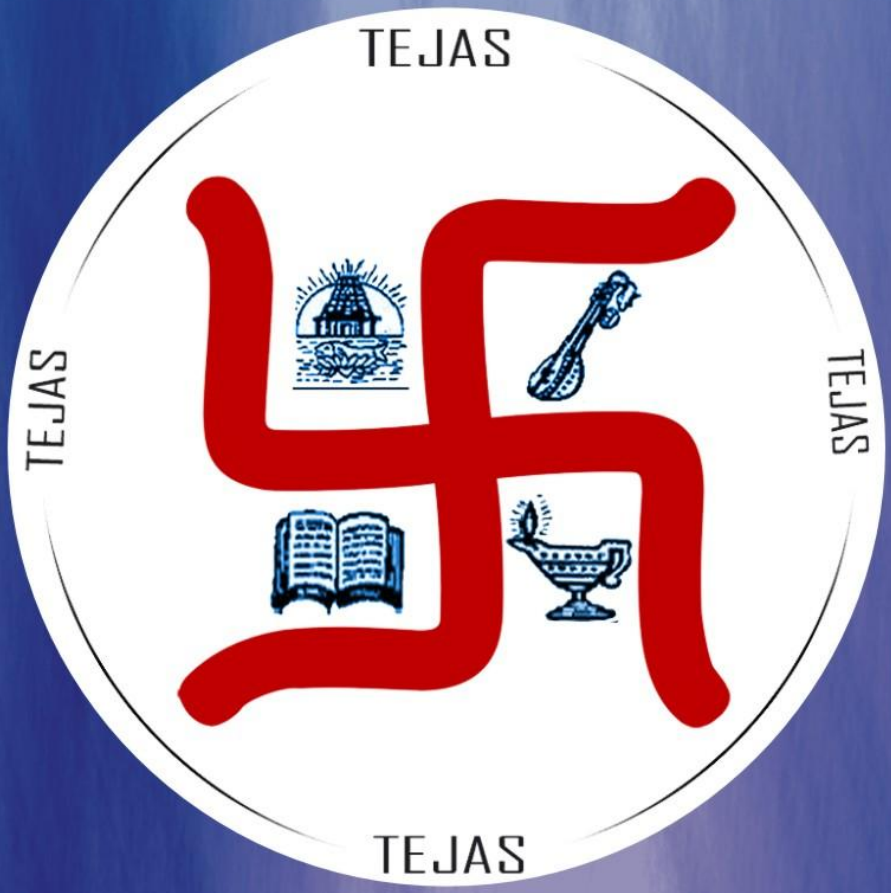


**Thiagarajar College, Madurai-625 009.**
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**Kalaithanthai Karumuttu Thiagarajar Chettiar**
**and**
**Kalaiannaiar Dr. Radha Thiagarajan**

Their lives are an inspiration
Their memories are a benediction

## Editorial

Dear Readers,

Thiagarajar College, Madurai publishes the college research journal, "TEJAS" two times an academic year and wishes to make it a more established part of the academic community. This issue of TEJAS features the work of author on a variety of topics representative of a multitude of academic perspectives in several disciplines, including biology, Economics, Tamil literature, Business Administration and Women Empowerment. I would like to sincerely congratulate each author whose paper has been included with in the journal. I hope you take the time to read and thoroughly enjoy each of the selections within this publication.

**M. Eyini**

# தேவாரப் பதிப்புகள்

**அ. மோகனா, தமிழ்த்துறை, தியாகராசர் கல்லூரி, மதுரை - 09**

பொதுவாகத் தமிழியலாய்வு இயங்குதளத்தில் இலக்கியங்கள், உரைகள், இலக்கணங்கள் இவை குறித்த ஆய்வுகளுக்கு அளிக்கப்படும் அங்கீகாரம் பதிப்பு வரலாற்றிற்கு அளிக்கப்படுவதில்லை.சமீபகாலமாகப் பதிப்பு வரலாறு குறித்த சில பதிவுகளும் புரிதல்களும் கவனப்படுத்தப்பட்டு வருகின்றன. இருப்பினும் அவை ஒரு வாய்பாட்டுத் தன்மையில் தொடக்ககாலப் பதிப்பாசிரியர்களையும் செவ்விலக்கியப் பதிப்பு வரலாற்றையும் மையமிட்டதாகவே உள்ளன.தமிழுலகைப் பொறுத்தவரை பதிப்பு வரலாறு மிக நீண்டது; விரிவானது.பதிவு செய்யப்படாமல் போன வெளிகள் அதிகம் இந்தப் பின்புலத்தில் 1864 தொடங்கி நடைபெற்ற தேவாரப் பதிப்புகள் குறித்தசில கவன ஈர்ப்பினை இக்கட்டுரை முன்வைக்கின்றது.

அச்சுக்கருவியின் பயன்பாடு காலனிய ஆதிக்கம், கிறித்தவமிஷனரிகளின் ஆக்கிரமிப்பு ஆகியவற்றைக் கடந்து பொதுவெளிக்குப் பத்தொன்பதாம் நூற்றாண்டில் கிடைத்தது. அதன் தொடர்ச்சியாகப் பதிப்பு என்னும் துறை தமிழ்ச்சமூகத்தில் புலமைச்செயல்பாடாக உருப்பெற்றது. ஓலையிலிருந்து அச்சுக்கு மாற்றுதல் என்கிற ஒற்றைப்புரிதலில் அச்சுப்பண்பாட்டினை வரையறுக்க இயலாது. தொல்வரலாற்றினை மீட்டுருவாக்கம் செய்கின்ற பணியாகவே இதனைப் புரிந்துகொள்ள முடியும்.

அச்சுக்கருவியின் பயன்பாடு தமிழ்ச்சூழலில் பாடபுத்தகங்கள், புராணங்கள், பிரபந்த இலக்கியங்கள் ஆகியவற்றை மையமிட்டிருந்த காலகட்டத்தில் உ.வே.சாமிநாதையர், சி.வை.தாமோதரம்பிள்ளை ஆகியோரால் தொல்பழம்பிரதிகளை மீட்டெடுக்கும் மடைமாற்றத்தினைப் பெற்றது. பத்தொன்பதாம் நூற்றாண்டின் இடைக்காலம் வரை தேவாரப் பிரதிகளின் அச்சாக்கத்தினைக் காண இயலவில்லை. இன்று பண்முறை, தலமுறை என்ற பகுப்புகளின் அடிப்படையில் தொகுக்கப்பட்டுப் பதிப்பிக்கப்பட்டுள்ள தேவாரப் பிரதிகளின் அச்சுவரலாறு 1864ஆம் ஆண்டிலிருந்துதான் தொடங்குகின்றது. மூலத்தைத் தேடிப் பதிப்பிக்கின்ற முயற்சியே தொடக்க காலத்தில் மேற்கொள்ளப்பட்டிருந்தது. இருபதாம் நூற்றாண்டின் தொடக்கத்தில்தான் உரையுடன் கூடிய பதிப்பு சாத்தியப்பட்டது. இப்பதிப்புகளின் தன்மைகளைக் கீழ்க்கண்ட நிலைகளில் புரிந்துகொள்ளலாம்.

- தேவாரப் பதிகங்களை முழுவதுமாக ஆளுமைகளின் அடிப்படையில் பதிப்பித்தல்
- தேவாரப் பதிகங்களைத் தலங்களின் அடிப்படையில் தொகுத்துப்பதிப்பித்தல்.
- குறிப்பிட்ட சில பதிகங்களை மட்டும் தேர்ந்தெடுத்து பிற பக்தி ஆளுமைகளின் பாடல்களோடு பதிப்பித்தல்
- குறிப்பிட்ட தலத்தில் தேவார மூவரால் பாடப்பட்ட பதிகங்களை மட்டும் கையடக்கப்பதிப்பாக வெளியிடுதல்.

அச்சுக்கருவிகளின் பயன்படுத்தத்தில் தேவாரப்பிரதிகள் பிறஇலக்கியங்களைக் காட்டிலும் காலத்தால் பிற்பட்டே இடம் பெற்றுள்ளன. இதற்கு இவற்றின் சமூக மதிப்பும் காரணமாக இருக்கலாம். நச்சினார்க்கினியர் தொல்காப்பிய உரையில் கொச்சக ஒருபோகு குறித்துப் பேசுமிடத்து, 'பதிகப் பாட்டிற்கு ஈண்டுக் கூறிய வேறுபாடுகள் திருவாய்மொழி, திருப்பாட்டு, திருவாசகம் என்கின்ற கொச்சக ஒருபோகுகளில் காண்க உலகவழக்கன்மையால் அவை காட்டாமையினாம்' என்று கூறியுள்ளது இங்குக் கருதத்தக்கது. தேவாரப் பாடல்கள் வடமொழியின் வேதங்களுக்கு இணையாக மறை என்ற நிலையிலான சமூக மதிப்பினைப் பெற்றிருந்தமையால் அவற்றை அச்சிடும் முயற்சி முன்னெடுக்கப்படாமல் இருந்திருக்கலாம். முதன்முதல் திருமயிலை சுப்பராய ஞானியார் சம்பந்தரின் முதல் மூன்று திருமுறைகளையும் திருவாவடுதுறை ஆதீனப் பிரதியை அடிப்படையாகக் கொண்டு காஞ்சிபுரம் சபாபதி முதலியார் அவர்களால் ஆராய்ச்சி செய்வித்து, அப்பாவுபிள்ளை, நமசிவாய முதலியார் ஆகியோரது பொருள் உதவிகொண்டு, குமாரய்யர் அவர்களுக்குச் சொந்தமான கலாநிதி அச்சுக்கூடத்தில் ருத்ரோத்காரி ஆண்டு ஐப்பசி திங்கள் (கி.பி.1864) பதிப்பித்து வெளியிட்டார். அடுத்துச் சுந்தரரின் ஏழாம் திருமுறையினைத் திருவாவடுதுறை ஆதீனப் பிரதியை அடிப்படையாகக் கொண்டு அதே காஞ்சிபுர வித்துவான் சபாபதி முதலியார் அவர்களால் ஆராய்ச்சி செய்வித்து, அதனைச் சண்முகவிலாச அச்சுக்கூடத்திலும் கலாநிதி அச்சுக்கூடத்திலுமாகக் குரோதன ஆண்டு ஆனித்திங்கள் (1865) பதிப்பித்துள்ளார். சம்பந்தர் தேவாரம் அச்சில் வெளிவந்த எட்டு மாதங்களுக்குள் சுந்தரர் தேவாரம் அச்சேறியது குறிப்பிடத்தக்கது. நாவுக்கரசர் அருளிச்செய்த நான்கு ஐந்து ஆறு ஆகிய மூன்று திருமுறைகளையும் திருவாரூர் செப்பேட்டின்படி பனையோலையில் எழுதுவித்த தருமபுர ஆதீனத்தில் இருந்த பிரதியை அடிப்படையாகக்கொண்டு அதே சபாபதி முதலியார் அவர்களைக் கொண்டு ஆராய்ச்சி செய்வித்து, ஆதிநாராயணபிள்ளையவர்கள் உதவியைக் கொண்டு, கலாநிதி அச்சுக்கூடத்திலும் புஷ்பரத செட்டியாருடைய கலாரத்னாகர அச்சுக்கூடத்திலுமாக அக்ஷய ஆண்டு

புரட்டாசித்திங்கள் (கி.பி.1866) பதிப்பித்து வெளியிட்டார். சுந்தரர் தேவாரம் வெளிவந்த பதினைந்து மாதங்களுக்குள் நாவுக்கரசர் தேவாரம் பதிப்பிக்கப்பெற்றது. இவ்வாறு கி.பி. 1864-1866 இல் பண்முறையில் ஏழு திருமுறைகளாகத் தொகுக்கப்பெற்ற மூவர் தேவாரமும் மூன்று தனித்தனி நூல்களாகப் பதிப்பிக்கப்பட்டு வெளியிடப்பட்டன. மேற்குறித்த பதிப்புகளின் மூலம் குறிப்பிட்டதொரு பதிப்பு முறைமை அக்காலத்தில் தொழிற்பட்டுள்ளமையினை அறியமுடிகின்றது. முதலில் சுவடிகளைத் திரட்டுதல், அதனைக் குறிப்பிட்டதொரு ஆளுமையின் மூலம் ஆராய்ச்சி செய்வித்தல் பின்னர் பதிப்பித்தல் என்கிற படிநிலை முறைமையினைப் பின்பற்றியுள்ளனர்.

கி.பி.1864-66 இல் பதிப்பிக்கப்பெற்ற தேவார நூல்கள் எவ்வளவு பிரதிகள் அச்சிடப்பெற்றன என்ற செய்தி தெரியவில்லை. மேலும் இத்தனை பிரதிகள் அச்சிடப்பெற்றன என்று குறிப்பிடும் வழக்கம் இன்றுவரை வெளிவந்துள்ள தேவாரப் பதிப்புகளில் காணஇயலவில்லை.

சுப்பராய ஞானியார் ஞானசம்பந்தர் தேவாரத்தின் இரண்டாம் பதிப்பினை வேளானூர் தெய்வசிகாமணி முதலியார் உதவியால் சென்னை பாஸ்டர் அண்டு கோ அச்சுக்கூடத்தில் ஈசுவர ஆண்டு ஆடி மாதத்திலும் (கி.பி.1875) சுந்தரர் தேவாரத்தின் இரண்டாம் பதிப்பினை அதே ஆண்டு அடுத்த சில மாதங்களுக்குள்ளும் பதிப்பித்து வெளியிட்டுள்ளார். அதற்குப் பின்னரான தேவாரப் பதிப்பு முயற்சிகள் ஏதும் இவரால் மேற்கொள்ளப்பெறவில்லை.

நாவுக்கரசரின் தேவாரப் பிரதியாக உமாபதி சிவாசாரிய சுவாமிகள் ஆதீனத்தில் இருந்த ஏட்டுச்சுவடியை அடிப்படையாகக் கொண்டு, காஞ்சிபுரம் திருச்சிற்றம்பல ஞானியார் அவர்களால் ஆராய்ச்சி செய்யப்பெற்ற 'பண்முறை நாவுக்கரசர் தேவாரம்' பாதரக்குடி ஆ.சொக்கலிங்கம் பிள்ளையவர்களால் பாஸ்டர் அச்சுக்கூடத்தில் கி.பி.1879 இல் பதிப்பிக்கப்பெற்றது.

மேற்குறித்த பதிப்புகள் அனைத்தும் பண்முறையில் தொகுக்கப்பட்டுப் பதிப்பிக்கப்பட்டவை. இப்பதிப்புகளில் முகப்பாக காரைக்காலம்மையாரின் திருவாலங்காட்டு மூத்த திருப்பதிகங்கள் இடம்பெற்றுள்ளன. சுப்பராய ஞானியவர்களால் பதிப்பிக்கப்பட்ட அனைத்துப் பதிப்புகளிலும் காரைக்காலம்மையாரின் பாடல்கள் முகப்பாக இடம்பெற்றுள்ளமை கவனிக்கத்தக்கது. பதினோராம் திருமுறை 1869 இல் தான் புஷ்பரதச்செட்டியாரால் முழுவதுமாகப் பதிப்பிக்கப்பட்டது. ஆனால் அதற்கு முன்னதாகவே காரைக்காலம்மையாரின் பாடல்கள் தேவாரத்தோடு இணைத்துப் பதிப்பிக்கப்பட்டுள்ளது குறிப்பிடத்தக்கது.

தலபுராணங்களின் தாக்கத்தில் தேவாரப் பாடல்களையும் தலங்களின் அடிப்படையில் தொகுத்துப் பதிப்பிக்கின்ற முயற்சி சில நிறுவனங்களால் முன்னெடுக்கப்பட்டது. வணிக ரீதியில் இம்முயற்சி பெரிதும் வெற்றிபெற்றுள்ளது. தனித்த ஆளுமைகளின் பதிகங்களைத் தலங்களின் அடிப்படையில் தொகுக்கும்போது குறிப்பிட்ட தலம் குறித்த புரிதல் சாத்தியமாகின்றது. முன்னர்க் குறித்தபடி தலபுராணங்கள் மக்களிடையே பெற்றிருந்த செல்வாக்கு தேவாரத்தில் தலமுறை பதிப்பினைச் சாத்தியப்படுத்தியது எனலாம்.

திருவாவடுதுறை ஆதீனத்தைச் சேர்ந்த சுப்பிரமணிய தேசிகரின் ஆணைக்கிணங்க திருப்பனந்தாள் காசிவாசி இராமலிங்கசுவாமிகளின் வேண்டுகோளின்படி, திருவாவடுதுறை ஆதீன ஓதுவார் ஓதின பண்ணின்படி மதுரையாதீனம் திருவாவடுதுறையாதீனம் முதலிய இடங்களில் இருந்த பிரதிகளை ஒப்பிட்டு மதுரை இராமசாமிப்பிள்ளை என்னும் ஞானசம்பந்தப்பிள்ளை சென்னை புஷ்பரத செட்டியாரது கலாரத்நாகர அச்சுக்கூடத்தில் விஷூ ஆண்டு மார்கழித் திங்கள் (1881) தலமுறையாகத் தேவாரம் முழுதையும் முதன்முறையாகப் பதிப்பித்து வழங்கினார்.

இப்பதிப்பு வணிகரீதியில் பெற்ற வெற்றியின் தொடர்ச்சியாகப் பதின்மூன்று ஆண்டுகள் இடைவெளியில் தலமுறைத் தேவாரம் மீண்டும் தருமையாதீனத் தலைவர் தவத்திரு சிவஞான தேசிக மூர்த்திகள் ஆணையின்படி, திருப்பனந்தாள் காசிவாசி சுவாமிநாதசுவாமிகள் விரும்பிய வண்ணம் திருமயிலை செந்தில்வேல் முதலியாரால் சென்னை விக்டோரியா ஜுபிலி அச்சுக்கூடத்தில் விஜய ஆண்டு சித்திரைமாதம் (1894) முதற்பதிப்பாகவும் அதே செந்தில்வேல் முதலியாரால் சென்னை கலாரத்நாகர அச்சுக்கூடத்தின் வாயிலாகக் குரோதி ஆண்டு தைத்திங்கள் (1905) இரண்டாம் பதிப்பாகவும் வெளிவந்தது.

பிறிதொருபுறம் பண்முறை அடிப்படையிலான தொகுப்புகளும் பதிப்பிக்கப்பட்டுவந்தன. திருவேங்கட நாயுடு அவர்களால் பார்வையிடப்பட்டுச் சண்முக முதலியார் அவர்களால் சென்னை ஆறுமுக விலாச அச்சுக்கூடத்தில் கி.பி.1898இல் பண்முறைத் தேவார அடங்கன்முறை மூன்றாம் முறையாகப் பதிப்பித்து வெளியிடப்பெற்றது.

பத்தாண்டுகளுக்கு உள்ளாகவே மீண்டும் பண்முறைத் தேவார அடங்கன்முறைப் பிரதிக்குத் தேவை ஏற்படவே, அது திருமுறை வரலாறு, மூவர் சரித்திரக் குறிப்பு முதலியவற்றுடன், திருமயிலை வித்துவான் சண்முகம் பிள்ளையவர்களால் பார்வையிட்ட பிரதிக்கு இணங்க, எஸ்.பி.ராஜாராம் அவர்களால் தமது ஸன் ஆப் இந்தியா அச்சியந்திரசாலையில் கி.பி1906 இல் பதிப்பிக்கப்பட்டது. பதினோராண்டுகளுக்குப் பின் இதன் மறுபதிப்பு கி.பி.1917 ஆம் ஆண்டு ஜூலைத் திங்களில் வெளிவந்தது. இதனை நமசிவாய முதலியார் அவர்கள் தமது நிரஞ்னவிலாச அச்சியந்திரசாலையில் பதிப்பித்து வெளியிட்டார்.

இந்த 1906ஆம் ஆண்டுப் பதிப்பை அடுத்து, பங்காளம் அப்பு பிள்ளையவர்கள் புலவர் பலரோடு பல பிரதிகளை ஒப்பிட்டு, சென்னை நேஷனல் அச்சுக்கூடத்தின் வாயிலாக கி.பி.1907 ஆம் ஆண்டு நவம்பர் திங்கள் முதல்நாள் பண்முறைமூவர் தேவாரப் பதிப்பு ஒன்றை வழங்கினார். இப்பதிப்பு வரையில் மூவர் பாடிய தேவாரப் பாடல்களின் எண்ணிக்கை குறித்த குறிப்புகளோ அவை பற்றிய தகவல்களோ தேவாரப் பதிப்புகளில் இடம்பெறவில்லை.

ஒரே திருமுறையாக அமைந்த சுந்தரர் தேவாரம், தலமுறைப்படி நாகலிங்க முதலியார் அவர்களால் பல சுவடிகளையும்கொண்டு பரிசோதிக்கப்பெற்றுக் கீலக ஆண்டு ஐப்பசித்திங்கள் (கி.பி.1908) ஆதிமூலம்செட்டியார் அவர்களால் சென்னை கலாரத்நகார அச்சுக்கூடத்தில் பதிப்பிக்கப்பெற்றுவெளிவந்தது. செய்யுள் முதற்குறிப்பு அகராதியை நூல் இறுதியில் பதிப்பித்து வழங்கும் வழக்கம், தேவாரத்தைப் பொறுத்தவரையில் இப்பதிப்பிலேயே தொடங்கியது எனலாம். மேலும் 8250 பாடல்கள் என்கிற எண்ணிக்கையும் இப்பதிப்பின் மூலமே கிடைக்கின்றது.

பல்லாண்டுகளாகப் பல பிரதிகளைக்கொண்டு யாழ்ப்பாணத்து வண்ணைநகர்ச் சாமிநாத பண்டிதர் அவர்கள் ஆராய்ந்து தாம் புதியனவாக எழுதிய பல செய்திகளுடன் சென்னை சைவ வித்யாநுபாலன அச்சியந்திரசாலை வாயிலாக வெளியிடப்பட்ட தலமுறை மூவர்தேவார அடங்கன்முறைத் தொகுதி சாதாரண ஆண்டு பங்குனிமாதம் (கி.பி.1911) வெளிவந்தது.

இவ்வாறு பண்முறையிலும் தலமுறையிலும் அச்சிடப்பட்ட தேவாரப்பிரதிகளில் பதிப்புரை, முன்னுரை போன்ற எந்தப் பகுதிகளும் இடம்பெறவில்லை. பதிகஅட்டவணை, பிழைதிருத்தம் ஆகியவையே தொடர்ச்சியாக இடம்பெற்றிருந்தன. பாடபேதம் அளிக்கின்ற முறைமையும் இத்தொடக்ககால அச்சுப் பிரதிகளில் காணப்படவில்லை. மேலும் சீர்கள் பிரிக்கப்படாமல் சில பதிகங்கள் நான்கு அடிகளாகவும் சில பதிகங்கள் சுவடியிலுள்ள பத்திகளாகவுமே பதிப்பிக்கப்பட்டுள்ளன. சில பகுதிகளில் குறிப்புகள் தருவதனை மட்டும் காணமுடிகின்றது. சம்பந்தரின் திருக்கலையநல்லூர் பதிகத்தின் 'பெருந்தேவர் சிரந்தோள் பற்கரங்கண் பீடழியச்' என்றுதொடங்கும் ஒன்பதாவது பாடலுக்குக்கீழ் 'எச்சன்சிரம், இந்திரன்தோள், சூரியன்பல், அக்கினிதேவன் கரம், பகன் என்னும்பெயருள்ள மற்றொரு சூரியன் கண் இவை பீடமிழந்தவை.' என்று குறிப்பு அளிக்கப்பட்டுள்ளது. மேலும் 'அரிசிலின் றென்கரைமேல்' என்ற பாடல் தொடருக்கு 'விஷ்ணுவினாற் சொல்லப்பட்டு வந்தமையால் அரிசொல் நதியென்று பெயர் அது அரிசில் என மருவியிருக்கின்றது. இதனைக்கும்பகோணபுராணத்திற் கண்டுகொள்க.' (1864:25) என்று குறிப்பு அளிக்கப்பட்டிருக்கின்றது. அவ்வாறே திருவெண்ணெய் நல்லூரும் திருநாவலூரும் என்னும் பதிகத்தின் மூன்றாவது பாடலில் 'கடற்கோடி' என்பது கோடிக்குழகரென்னுந்தலம், மோடி என்பது அங்குக் கோயில் கொண்டிருக்கும் துர்க்கை (1864:26) என்ற குறிப்பு அளிக்கப்பட்டிருக்கின்றது. 'முதுகுன்றமென்னும் விருத்தாசலத்தில் பரமசிவம் அருளிச்செய்த பொன்னை மணிமுத்தாநதியிலிட்டுப் போய்த் திருவாரூர்க் கமலாலயமென்னுந் திருக்குளத்திலிறங்கிக் கையால்தடவும்போதோதிய பதிகம் அவ்வாறு தடவும்போது ஏத்தாதிருந்தறியேனென்னுந் தேவாரமோதுகையில் பொருளகப்பட்டது.' (1864:38) என்று முதுகுன்றத் திருப்பதிகத்திற்குக் குறிப்பு அளிக்கப்பட்டுள்ளது. முதற்பதிப்பில் அளிக்கப்பட்ட இக்குறிப்புகள் தொடர்ந்து வந்த பிற பதிப்புகளிலும் அவ்வாறே அளிக்கப்பெற்றுள்ளன. மூலத்தை மட்டும் பதிப்பித்து வெளியிட்ட இத்தொடக்ககால முயற்சிகள் தலஅடிப்படையிலான பதிப்பு என்னும் நிலையில் வணிகநோக்கிலான அடுத்த கட்ட நகர்வினைப் பெற்றன. இப்பதிப்புகள் யாவும் தேவாரப் பாடல்களைப் பாராயணம் செய்தல் என்கிற வெகுசன நுகர்வினை அடிப்படையாகக் கொண்டே உருவாக்கப்பட்டுள்ளன.

இருபதாம் நூற்றாண்டின் தொடக்கத்தில் இரண்டுநிலைகளில் தேவாரப் பதிப்புகள் தொழிற்பட்டன. ஒன்று இப்பாடல்களைப் பொருள் புரிந்து படிக்க வசதியாக உரையுடன் பதிப்பிக்க முயன்றனர். பிறிதொருபுரம் சில பதிகங்களை மட்டும் தேர்ந்தெடுத்து தாயுமானவர், இராமலிங்கர் ஆகியோரின் பாடல்களோடு சேர்த்து அச்சுப்போட்டனர். 1915-1919 வரை இவ்வகையிலான பதிப்புகள் தொடர்ந்துள்ளன. தேவாரத் தோத்திரத்திரட்டு என்கிற பெயரில் சைவசமயசாரிகளாகிய நால்வரது சரித்திரமும் தேவார திருவாசகத் திருமுறைகளினின்றும் தாயுமானவர் திருப்பாடல்களினின்றும் இராமலிங்கசுவாமி திருவருட்பாவிலிருந்தும் தெரிந்தெடுக்கப்பட்டனவற்றை ஒருங்குசேரத்திரட்டி வித்தியாரத்தினாகர அச்சுக்கூடத்தில் 1915ஆம் ஆண்டு பதிப்பிக்கப்பட்டது. அதே

ஆண்டு சக்ரவர்த்தி அச்சுக்கூடத்திலும் இரண்டாம் பதிப்பாக இத்திரட்டு வெளிவருகின்றது. 1916 ஆம் ஆண்டு அதாவது ஓராண்டு இடைவெளியில் சாஸ்திர ஸஞ்சீவிநி அச்சியந்திரசாலையில் வெளியிடப்பட்டது. சம்பந்தர், நாவுக்கரசர், சுந்தரர் ஆகியோரது பாடல்கள் மட்டுமே தேவாரம் என்று கருதப்பட்ட நிலையில் மாணிக்கவாசகர், தாயுமானவர், இராமலிங்கர் ஆகியோரின் பாடல்களையும் தேவாரத் தோத்திரத்திரட்டு என்கிற பெயரில் வெளியிட்டிருப்பது கவனத்திற்குரியது. இத்தேவாரத் தோத்திரத்திரட்டு 1919 ஆம் ஆண்டு மீண்டும் திருவேங்கட முதலியார் அவர்களால் சென்னை வாணீ விலாச அச்சுக்கூடத்தில் பதிப்பிக்கப்பட்டது.

இப்பதிப்புகளில் சம்பந்தரின் பதினைந்து பதிகங்கள், நாவுக்கரசரின் முப்பது பதிகங்கள், சுந்தரரின் பதினோரு பதிகங்களோடு மாணிக்கவாசகரின் பன்னிரண்டு பாடல் தொகுதிகளும் தாயுமானவரின் பதினெட்டுப் பாடல்கள் இராமலிங்கரின் ஒரு பாடலும் சேர்த்துத் தொகுக்கப்பட்டுள்ளன. எந்த அடிப்படையில் இப்பதிகங்களும் பாடல்களும் தொகுக்கப்படுகின்றன என்பதற்கான குறிப்புகள் எதுவும் இப்பதிப்புகளில் இடம்பெறவில்லை. தேவாரமூவர் மற்றும் மாணிக்கவாசகரின் வரலாறுகள் மட்டும் சுருக்க உரைநடை வடிவில் அளிக்கப்பெற்றுள்ளன. இத்தோத்திரத் திரட்டுகள் மக்களிடையே நல்ல வரவேற்பினைப் பெற்றிருந்தமையினை இவற்றின் தொடர்ச்சியான பதிப்புகளின் மூலம் அறிந்து கொள்ளமுடிகின்றது.

இவ்வாறு திரட்டுகளாகத் தேவாரப் பாடல்கள் பதிப்பிக்கப்பட்ட நேரத்தில் தேவாரம் முழுமைக்கும் உரை எழுதி அச்சிடும் முயற்சியும் மேற்கொள்ளப்பட்டது. காஞ்சிபுரம் மகாவித்வான் ஸ்ரீமத் இராமாநந்த யோகிகள் பண்முறைச் சுந்தரர் தேவாரத்திற்குப் பதவுரை பொழிப்புரை கருத்துரை விசேடவுரை ஆகியவற்றை எழுத, பண்முறைச் சுந்தரர் தேவாரம் உரை விளக்கங்களுடன் பு.சண்முக முதலியார் அவர்களால் சென்னை மதராஸ் டைமண்ட் பிரஸில் கி.பி.1913இல் அச்சிடப்பெற்று வெளிவந்தது. இப்பழைய பதிப்புகளுக்குப் பின் வந்த பதிப்புகள் யாவும் இந்த அச்சுப் புத்தகங்களை ஆதாரமாகக் கொண்டு பதிப்பிக்கப்பெற்றன. 1925இல் வெளியான பதிப்பும் குறிப்பிடத்தக்கதாக உள்ளது. குறிப்பிட்ட தலத்தில் மூவர் பாடிய பதிகங்களை மட்டும் தொகுத்துப் பதிப்பித்த முயற்சியும் சிலரால் மேற்கொள்ளப்பட்டுள்ளது. அவை தற்போதைய திரையிசைப் பாடல் புத்தக வடிவில் உள்ளன. திருக்குற்றாலத் தலத்தில் சைவசமாயாசாரியர்களாகிய மூவர் பாடிய பதிகங்களைத் தொகுத்து மிறுத்யுஞ்சய நீலகண்டம் அடுமை ஆத்தூர், ரா.ம.சுப்பிரமணியபிள்ளை அவர்களால் பிரசுரிக்கப்பெற்று தென்காசி ஸ்ரீ ராமானுஜம் பிரஸில் பதிப்பிக்கப்பட்டு வெளியிடப்பெற்றுள்ளது.

இப்பதிப்பிலும் பதிப்புரை, முன்னுரை போன்ற எந்த குறிப்புகளும் இடம்பெறவில்லை. ஆனால் பின்புற அட்டையில் இடம்பெற்றுள்ள விளம்பரம் குறிப்பிடத்தக்கதாக உள்ளது.

இனாம்இனாம் 'சைவ சமையாசாரியர்களால் பாடல்பெற்ற ஸ்தலமாகிய திரிமூர்த்திகள் தங்கும் திருக்குற்றால மகாத்தியம்' ஒரு அணா ஸ்டாம்பு அனுப்புகிறவர்களுக்கு புஸ்தகம் ஒன்று இனாமாயனுப்பப்படும்.

டி.எஸ்.குருசாமிப்பிள்ளை, பைண்டர், ஸ்ரீராமானுஜம்பிரஸ், தென்காசி

இப்புஸ்தகம் விற்கிறவரிடத்திலும், மேற்படி புஸ்தகம் முக்காலணா விலைகொடுத்துப் பெற்றுக் கொள்ளலாம்.

தலபுராணங்களுக்கும் தலமுறைத் தொகுப்பிற்கும் இவ்வாறு குறிப்பிட்ட தலத்தை மட்டும் பாடிய பதிகங்களைத் தொகுத்துப் பதிப்பிக்கின்ற முறைமைக்குமான உறவு இங்கு நோக்கத்தக்கது.

1925க்குப் பிறகு தேவாரப் பதிப்புச் செயல்பாடு நிறுவனம் சார்ந்த மிகப்பெரும் வணிகச்செயல்பாடாக முன்னெடுக்கப்பட்டது. சைவசித்தாந்த நூற்பதிப்புக் கழகம் கயப்பாக்கம் சதாசிவ செட்டியார் அவர்களைக்கொண்டு கி.பி.1927 பிப்ரவரி மாதத்தில் சம்பந்தர் தேவாரத்தையும் கி.பி.1928 பிப்ரவரி மாதத்தில் நாவுக்கரசர் தேவாரத்தையும் கி.பி.1929 ஏப்பிரலில் சுந்தரர் தேவாரத்தையும் பண்முறையை ஒட்டித் தனித்தனி நூல்களாக அச்சிட்டு வழங்கியது.

அடுத்து, பண்முறை தேவாரம் சைவ சித்தாந்த சமாஜத்தின் பதிப்பாக கி.பி.1929-31இல் மூன்று தொகுப்புகளாக மிகக் குறைந்த விலையில் வெளியிடப்பெற்றது. இளமுருகனார் பதிப்பித்த பண்முறை அடங்கன்முறை தேவாரம் பல செய்திகளுடன் ஒரே தொகுப்பாக மிகக் குறைந்த விலையில் 1953இல் வெளிவந்தது. இளமுருகனாரின் பதிப்பே இன்றுவரை பல நிறுவனங்களாலும் ஆராய்ச்சியாளர்களாலும் பயன்படுத்தப்படுகின்ற பதிப்பாக உள்ளது. இப்பதிப்பில் தான் கல்வெட்டுமூலம் கிடைக்கப்பெற்ற

சம்பந்தரின் திருவிடைவாய்ப் பதிகமும் கிளியன்னவூர்ப்பதிகமும் இடம்பெற்றன. இப்பதிகங்களின் பாடல் தொகையினையும் சேர்த்து 2872 பாடல்களாகத் தேவாரப் பாடல்கள் கணக்கிடப்பட்டன. கிளியன்னவூர்ப்பதிகம் பி.ஜானகிராம முதலியாரிடம் பெற்று சித்தாந்தம் மலர் 5 இதழ் 11 (1932)இல் வெளியிடப்பட்டது. கி.பி.1953 முதல் 1964 வரை தனித்தனி ஏழு திருமுறைகளும் விளக்கங்களுடன் தருமபுர ஆதினப் பதிப்புகளாக வெளிவந்தன.

1941 இல் வெளிவந்த சில பதிப்புகள் இந்நிலையில் கருதத்தக்கன. திருக்குற்றாலத் திருப்பதிகங்கள் தொகுத்து அளிக்கப்பட்டதைப் போலவே திருவேட்டக்குடி குறித்த பதிகங்கள் மட்டும் தொகுத்து அச்சிடப்பட்டுள்ளன. திருவேட்டக்குடித் தேவாரத் திருப்பதிகம் இஃது திருநெல்வேலி, மணிவாசக ஞானசம்பந்த சபை அத்யக்ஷகர், பா.சிதம்பரநாத பிள்ளை அவர்களால் எழுதிய அருஞ்சொற் குறிப்புகளுடன் திருவேட்டக்குடிச் சிவாலய தரும பரிபாலகர் தேவகோட்டை, திருவாளர் மெ.லெ.ராம இலக்குமணன் செட்டியார் அவர்களால் மாயவரம் வஸந்தா பிரஸில் அச்சிட்டு, விக்ரம ஆண்டு மாசி மாதம்நிகழ்ந்த மகத்திருவிழாவில் அன்பர்களுக்கு வழங்கப்பெற்றதாக அப்பதிப்பில் குறிப்பு உள்ளது. மேலும் அப்பதிப்பில் எழுதப்பட்டுள்ள முன்னுரை திருவேட்டக்குடி தலத்தின் பெருமையினையும் எதற்காக இம்முயற்சி மேற்கொள்ளப்பட்டது என்கிற காரணத்தினையும் தெரிவித்துள்ளது.

திருவேட்டக்குடி சோழநாட்டிலே உள்ள ஒரு சிவக்ஷேத்திரம். இதற்குத் திருஞானசம்பந்த மூர்த்தி நாயனார், திருநாவுக்கரச நாயனார் தேவாரமும் இன்னும் சில ஆன்றோரது திருவாக்குகளும் பாடப்பெற்ற மகிமை உள்ளது. இச்சேத்திரமான்மியத்திலே அம்மை தவஞ்செய்து வரம் பெற்றது, தேவர்கள் பூஜை செய்தது. அர்ச்சுனன் தவஞ் செய்து பாசுபாஸ்திரம் பெற்றது. அனவரத மகாராஜன் தரிசனம் செய்து புரந்தருளிய ஐயடிகள் காடவர்கோன் என்னும் அரசன் சிவஸ்தலங்கள் தோறும் சென்று திருப்பணிகள் செய்து அவ்வத்தலங்களுக்குத் தனித்தனி வெண்பாப்பாசுரங்கள் பாடிவரும்போது இத்தலத்துக்கு வந்து வெண்பாப்பாடித் தொண்டு செய்து வசித்துவருங்கால் சுவாமி காட்சி தந்து மோட்சங்கொடுத்தருளப் பெற்றது முதலிய மகிமைகள் உள்ளன. வடமொழியிலுள்ள இந்த க்ஷேத்திர மான்மியத்தைத் தமிழில் புராணச் செய்யுளாகவும், வசனமாகவுஞ் செய்து அச்சிட்டு வெளியாயிருக்கிறது... இத்திருவேட்டக்குடி யெனும்சிவஸ்தலம் சுவாமி தெரிசனஞ் செய்ய வருபவர்களுக்கும் மிக வசதியான இடம். கடற்கரைப் பக்கமாயுள்ளது. சோலைவளஞ் செறிந்தது நல்ல தண்ணீர் வசதி உள்ளது. நெய், பால், தயிர், காய்கறி, அரிசி சாமான்கள் நயமாய் கிடைக்கக்கூடியது. (1941:2,3)

கி.பி.1953 முதல் 1964 வரை தனித்தனி ஏழு திருமுறைகளும் உரைவிளக்கங்களுடன் தருமபுர ஆதீனப் பதிப்புகளாக வெளிவந்தன. யாப்பு அடிப்படையில் சீர்களைப் பிரித்து பாடல்கள் பதிப்பிக்கப்பட்டுள்ளன. கி.பி.1968இல் திருப்பனந்தாள் காசிமடத்துப் பதிப்பாகத் தலமுறை தேவாரம் முழுமையும் ஒரே தொகுப்பாக வெளியிடப்பட்டது. சீர்கள் பிரிக்கப்படாமல் அடிகள் மட்டும் வரையறுக்கப்பட்டுப் பாடல்கள் பதிப்பிக்கப்பட்டுள்ளன. திருப்பனந்தாள் காசிமடம் தனித்தனியாகத் தேவார மூவரின் பதிகங்களைத் தலமுறையில் தொகுத்துப் பதிப்பிக்கின்ற பணியினை 1950கள் தொடங்கி 1978 வரை தொடர்ச்சியாகச் செய்துவந்துள்ளது. 1979 -1980இல் பூம்புகார் கல்லூரிப் பதிப்பாகப் பண்முறையில் திருநாவுக்கரசர் தேவாரம் வெளிவந்துள்ளது. அவ்வாறே பண்முறையை ஒட்டி முறையே 1981,1982இல் சுந்தரர், நாவுக்கரசர் தேவாரங்கள் திருவாவடுதுறை ஆதினத்தாரால் பதிப்பிக்கப்பட்டு வெளியிடப்பட்டுள்ளன. மேற்குறித்த பதிப்புகள் மட்டுமன்றி வரலாற்றுமுறை பதிப்பும் தேவாரப் பதிகங்களுக்கு உள்ளது. அற்புதங்களின் அடிப்படையில் இவற்றைப் பதிப்பித்த போக்கினையும் காணமுடிகின்றது. 1984 ஆம் ஆண்டு தி.வே.கோபலையர் கொண்டு வந்த பண்முறைத் தேவாரப் பதிப்பு தேவாரத்திற்கான சிறந்த ஆராய்ச்சி பதிப்பாக உள்ளது. இளமுருகனாரின் பதிப்பினை அடிப்படையாகக் கொண்டே தி.வே.கோபாலையரின் பதிப்பு உருப்பெற்றுள்ளது. இருபதாம் நூற்றாண்டின் தொடக்கத்தில் உருப்பெற்ற தேவாரப் பதிப்புகளில்தான் சீர்பிரித்துப் பதிப்பிப்பிக்கப்பட்ட பாடல்களைக் காணமுடிகின்றது. யாப்பு அடிப்படையில் சீர்களை வரிசைபடுத்திய பதிப்புகளும் தருமபுரம் உள்ளிட்ட ஆதினங்களால் வெளியிடப்பட்டுள்ளன. இந்நிலையில் தி.வே.கோபாலையர் தனது பதிப்பு முயற்சிக்கான காரணத்தினை,

தேவாரப் பாடல்களைச் சீர்பிரித்து அடி வரையறுத்துப் பதிப்பித்த பதிப்புக்களே முன்னைய பதிப்புக்கள் ஆதலின், ஓரளவே தமிழ் கற்றவர் எளிதில் சொற்களைப் பிரித்துப் பொருள் உணர்ந்து சுவைத்துப் படித்தற்கண் இடர்ப்பாடு பெரிதும் ஏற்படுகிறது. ஆதலின், சீர்பிரிப்பைப் பற்றிப் பெரிதும் கருதாது பொருள் விளங்குதல் ஒன்றையே குறிக்கோளாகக் கொண்டு, சொற்களைப் பிரித்து ஏற்ற இடங்களில் நிறுத்தக்குறிகளை அமைத்துப் பாடலைப் படித்த அளவிலேயே ஓரளவு பொருள் உணருமாறு செய்து, அருஞ்சொல் சொற்றொடர் இவற்றின் பொருள்களை இறுதியில் தந்து அமைக்கப்படும் பதிப்பு ஒன்று இப்போது தேவைப்படுவதாகிறது. (தேவார ஆய்வுத்துணை:நீறீஜ்வீஜ்)

என்று விளக்கியுள்ளார். தனிநபர் நிறுவனங்களால் வெளியிடப்பட்ட பதிப்புகள் முழுவதும் வணிக நோக்கத்தினையே அடிப்படையாகக் கொண்டிருந்தன. ஆதீனங்களால் வெளியிடப்பட்ட பதிப்புகள் சைவத் திருமுறைகள் என்னும் நிலையில் அவற்றின் பொருள், சிறப்பு ஆகியவற்றை மையமிட்ட பதிப்புகளாக அவை உருப்பெற்றன. இவற்றைக் கடந்து தி.வே.கோபாலையர் முதலிய ஆய்வறிஞர்களால் உருவாக்கப்படுகின்ற பதிப்புகளே தேவாரம் குறித்த முழுமையான புரிதலையும் அதில் ஆய்வுமேற்கொள்வதற்கான களத்தினையும் தருவனவாக உள்ளன.

**துணை நின்ற பதிப்புகள்**

1863 சைவசமயாசாரிகளில் முதல்வராகிய திருஞானசம்பந்த சுவாமிகள் அருளிச்செய்த தேவாரப் பதிகங்கள் திருமுறை மூன்றும்/ கயிலாய பரம்பரையாகிய திருவாவடுதுறை ஆதீனத்துப் பிரதிக்கிணங்கவித்வான் காஞ்சீபுரம் சபாபதி முதலியாரவர்களால் ஆராய்ச்சிசெய்து திருநெல்வேலி அப்பாவுபிள்ளை யுதவியினாலும் வாயிலா நெல்லூர் நமசிவாய முதலியார் உதவியினாலும் திருமயிலை சுப்பராயஞானியாரால் பால்குரிகி குமாரையரவர்களது கலாநிதி அச்சுக்கூடத்தில் பதிப்பிக்கப்பட்டது, ருத்திரோற்காரி, அர்ப்பசி

1865 சைவசமயாசாரியார்களில் ஒருவராகிய நம்பியாரூரரென்னும் சுந்தரமூர்த்தி சுவாமிகள் அருளிச்செய்த தேவாரப் பதிகத்திருமுறை/ கயிலாய பரம்பரையாகிய திருவாவடுதுறை ஆதீனத்துப் பிரதிக்கிணங்க வித்துவான் காஞ்சீபுரம் சபாபதி முதலியாரவர்களால் ஆராய்ச்சி செய்வித்து தருமயிலை சுப்பராயஞானியாரால் பதிப்பிக்கப்பட்டது. சண்முக விலாச அச்சுக்கூடம்.

1877 சைவசமயசார்யார்களில் முதல்வராகிய திருஞானசம்பந்தசுவாமிகள் அருளிச்செய்த தேவாரப்பதிகங்கள் திருமுறைமூன்றும்/ கயிலாயபரம்பரையாகிய திருவாவடுதுறை ஆதீனம் வித்வான் காஞ்சீபுரம் சபாபதி முதலியாரவர்களால் ஆராய்ச்சி செய்வித்து சென்னை வேப்பேரி சூளைசாமி பிள்ளை வீதியிலிருக்கும் கதிரப்பூர் சிங்காரவேலு முதலியார் கேட்டுக்கொண்டபடி திருமயிலை சுப்பராயஞானியரால் பதிப்பிக்கப்பட்டது. சென்னை, ஸி.பாஸ்டர் அண்டுகோ அச்சுக்கூடம்

1881 சைவசமயாசாரியர்களாகிய திருஞானசம்பந்தமர்த்தி நாயனார் திருநாவுக்கரசு நாயனார் சுந்தரமூர்த்தி நாயனார் இம்மூவரும் திருவாய்மலர்ந்தருளிய தேவாரம் ஸ்தலமுறை/ திருக்கைலாசபரம்பரைச் சந்தான குரவருள் ஒருவராகிய உமாபதி சிவாசாரிய சுவாமிகள் வகுத்தருளிய வண்ணம் அக்கைலாச பரம்பரைத் திருவாவடுதுறை ஆதீனத்து சுப்பிரமணிய தேசிகசுவாமிகள் கட்டளையிட்டரளியபடிக்கும் திருப்பனந்தாட் காசி மடாலயாதிபதிகளாகிய ஸ்ரீகாசிவாசி இராமலிங்க சுவாமிகள் ஸ்ரீகாசிவாசி குமாரசாமிச்சுவாமிகள் வேண்டுகோளின்படிக்கும் மேற்படி ஆதீனத்துச்சுப்போதுவார் ஓதிய பண்ணின்படிக்கும் மதுரை ஆதீனத்தும் திருவாவடுதுறை ஆதீனத்தும் மற்றைய இடங்களிலும் உள்ள பிரதிரூபங்களைக் கொண்டு மதுராபுரிவாசியாகிய இ.இராமசுவாமிப்பிள்ளை என்று வழங்குகின்ற ஞானசம்பந்தப்பிள்ளையால் பரிசோதித்து அற்புதப் பதிகசரிதங்களோடு சென்னைப்பட்டணம் ஊ.புஷ்பரதசச்செட்டியாரது கலாரத்னகார அச்சுக்கூடத்தில் பதிப்பிக்கப்பட்டது.

1893 சைவசமயாசாரியார்களில் ஒருவராகிய நம்பியாரூரனென்னுஞ் சுந்தரமூர்த்தி சுவாமிகள் அருளிச்செய்த தேவாரப் பதிகங்கள்/வித்வான் காஞ்சீபுரம் சபாபதி முதலியாரவர்களால் ஆராய்ச்சி செய்த பிரதிக்கிணங்க திருமழிசை கந்தசாமி முதலியார் குமாரரும் சொக்கபுரம் இராமலிங்கத்தம்பிரானவர்கள் மாணாக்கரும் சென்னை வீரசைவசமயாபிவிர்த்தி சபாப்பிரசங்கியாருமாகிய வடிவேலு முதலியாரவர்களால் பார்வையிடுவித்து பால்குரிகி குமாரையரவர்கள் பௌத்திரர் சிவலிங்கையரவர்களால்... பதிப்பிக்கப்பட்டது. ஆதிகலாநிதி அச்சுக்கூடம்,

1898 சைவசமயாசாரியார்களில் ஒருவராகிய நம்பியாரூரனென்னுஞ் சுந்தரமூர்த்தி சுவாமிகள் அருளிச்செய்த தேவாரப் பதிகங்கள்/வித்வான் காஞ்சீபுரம் சபாபதி முதலியாரவர்களால் ஆராய்ச்சி செய்த பிரதிக்கிணங்க திருக்கைலாசபரம்பரைப் பொம்மபும் ஸ்ரீ சிவஞானபாலைய தேசிகராதீனத்துச் சிதம்பரம் ஈசானியமடம் இராமலிங்க சுவாமிகளவர்கள் மாணக்கருளொருவரான க.வே.திருவேங்கடநாயுடு அவர்களால் பார்வையிடப்ட்டு காணியம்பாக்கம் முருகேச முதலியாரவர்கள் குமாரர் சண்முகமுதலியாரால் பதிப்பிக்கப்பட்டன. சென்னை ஆறுமுகவிலாச அச்சுக்கூடம்.

1900 சைவசமயாசாரியராகிய நம்பியாரூரரென்னும் சுந்தரமூர்த்திசுவாமிகள் அருளிச்செய்த அடங்கன்முறைத் தேவாரப் பதிகங்கள்/ இஃது உரையாசிரியர் வித்வான் காஞ்சீபுரம் சபாபதி முதலியாரவர்கள் ஆராய்ச்சிசெய்து பதிப்பித்த பிரதிக்கிணங்க புரசை அஷ்டாவதானம் சபாபதி முதலியாரவர்கள் மாணாக்ககர் திருமயிலை வித்வான் சண்முகம்பிள்ளையவர்களால் பார்வையிடப்பட்ட பிரதிக்கிணங்க மதுரை புத்தக வியாபாரம் இ.ரா.ம.குருசாமிக்கோனார் விருப்பத்தின்படி பிருங்கிமாநகரம் வேம்புலி முதலியார் குமாரர் நமசிவாய முதலியாரவர்களது பதிப்பிக்கப்பட்டது. சென்னை, நிரஞ்சனிவிலாச அச்சியந்திர சாலை, சார்வரி, ஆனி சண்முகம்பிள்ளை, திருமயிலை.

1903 மூவர் அருளிச்செய்த தேவாரப் பதிகங்களுள் பதினைந்து பதிகம்/ இஃது மைலம் சுப்பிரமணிய சுவாமிகளால் பார்வையிடப்பட்டு சென்னை இட்டா பார்த்தசாரதி நாயுடு அவர்களாற்றமது பத்மநாப விலாச அச்சு'கூடத்தில் பதிப்பி'கப்பட்டது.

1908 திருநாவலூர் சுந்தரமூர்த்தி நாயனார் அருளிச்செய்த தேவாரம்/திருக்கைலாய பரம்பரைத் திருவாவடுதுறையாதீனத்து மஹாசந்திதானம் அம்பலவாண பல தேசிகசுவாமிகள் கட்டளையிட்டருளியபடி மதுரைத் தமிழ்ச்சங்கத்து வித்துவான் வண்ணக்களஞ்சியம் காஞ்சி நாகலிங்கமுதலியாரால் பல பிரதிகளைக் கொண்டு பரிசோதித்து, பெரியமேட்டு வேங்கடாசலஞ் செட்டியாரவர்கள் குமாரர் ஆதிமூலஞ்செட்டியாரால் பதிப்பிக்கப்பட்டது சென்னை கலாரத்நகார அச்சுக்கூடம்,

1915 தேவாரத் தோத்திரத்திரட்டு/ இஃது சைவசமயசாரிகளாகிய நால்வரது சரித்திரமும் தேவார திருவாசகத் திருமுறைகளினின்றும் தாயுமானவர் திருப்பாடல்களினின்றும் இராமலிங்கசுவாமி திருவருட்பாவிலிருந்தும் தெரிந்தெடுக்கப்பட்டனவற்றை ஒருங்குசேரத்திரட்டி வித்தியாரத்தினாகர அச்சுக்கூடத்தில் பதிப்பிக்கப்பட்டது.

1915 தேவாரத் தோத்திரத்திரட்டு/ இஃது சைவசமயசாரிகளாகிய நால்வரது சரித்திரமும் தேவார திருவாசகத் திருமுறைகளினின்றும் தாயுமானவர் திருப்பாடல்களினின்றும் இராமலிங்கசுவாமி திருவருட்பாவிலிருந்தும் தெரிந்தெடுக்கப்பட்டனவற்றை ஒருங்குசேரத்திரட்டி சக்ரவர்த்தி அச்சுக்கூடத்தில் பதிப்பிக்கப்பட்டது.

1916 சைவசமயாசாரிகளாகிய நால்வர்கள் திருவாய்மலர்ந்தருளிய தேவாரத் திருவாசகத் தோத்திரத்திரட்டும், மேற்படியார்களது சரித்திரச்சுருக்கமும் அடங்கியுள்ளன. சாஸ்திரஸஞ்சீவிநீ அச்சியந்திரசாலை,

1917 சைவசமாயாசாரியார்கள் அருளிச்செய்த தேவாரம் திருவாசக முதலிய தமிழ் வேதத் திருமுறைத்திரட்டு/ இதில் பன்னிருதிருமுறை, திருப்புகழ், திருவகுப்பு இவைகளினின்றும் திரட்டப்பட்ட முக்கியமானவைகளும், சமயசாரிய சரித்திர சங்கிரமும் சேர்ந்துள்ளன., மதராஸ் கணேஷ்ப்ரெஸ்.

1919 தேவாரத் தோத்திரத்திரட்டு/ இவை சைவசமயாசாரிகளாகிய நால்வரது சரித்திரமும் நால்வருந் திருவாய் மலர்ந்தருளிய தேவார திருவாசகத் திருமுறைகளினின்றும் தாயுமானவர் திருப்பாடல்களினின்றும் தெரிந்தெடுக்கப்பட்டனவற்றை ஒருங்கு சேரத் திருத்தி திருமயிலை திருவேங்கட முதலியார் அவர்களாற்றமது. சென்னை வாணீ விலாச அச்சுக்கூடத்தில் பதிப்பிக்கப்பட்டது.

1928 சைவ சமயாசாரியர் மூவர் அருளிச்செய்த தேவார அடங்கன்முறை பண் அடைவு/ சென்னைப் பச்சையப்பன் கலாசாலைத் தமிழாசிரியரும் சித்தாந்தம் பத்திராசிரியருமாகிய திருவாளர் மணி.திருநாவுக்கரசு முதலியார் அவர்களால் பல பிரதிரூபங்களைக் கொண்டு ஆராய்ந்து செப்பஞ் செய்து அமரம்பேடு இரங்கசாமி முதலியார் அண்டு சன்ஸ் பூமகள் விலாச அச்சுக்கூடத்தில் பதிப்பிக்கப்பட்டது.

# Employment Growth in Indian Textile Industry during Pre and Post Liberalization Period

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Textile industry holds a significant status in the Indian Economy. It provides one of the most fundamental necessities of man namely clothing. It is an independent industry, from the basic requirement of raw materials to the final products, with huge value-addition at every stage of processing. Today textile sector accounts for nearly 14 percent of the total industrial output, and it contributes about 30 percent of the total exports.

There is a sense of optimism and confidence prevailing in the industry and is projected to grow at the rate of 16 percent in value terms in the next five years. Investment has increased significantly in the textile sector and it is expected to touch Rs. 1, 85,600 crore by 2014. This enhanced investment will generate 17.37 million jobs (comprising 12.02 million direct and 5.35 million indirect jobs) by 2015. Today, the industry is increasingly embracing modern technology and work process, becoming more globally competitive, building strong brand equity for its products, and consistently achieving higher growth rates than ever in its long history. It has been noticed that the Government is committed to address the domestic and international challenges confronting this sunrise sector, keeping in view the possibilities of quantitative transformation. The strong and diverse raw material base, cheap labour, ever-growing domestic market and better technologies relative to other developing countries are the basic strengths of the Indian textile sector which have given a place of prominence to the industry, in the industrial map of the country. Development of modern textiles in India had gained momentum owing to the availability of indigenous cotton and British machinery and a well-developed mercantile tradition in colonial India.

Indian textile sector was predominantly unorganized, but the scenario started changing after the economic liberalization. The Indian Textile Policy of 1985 completely protected this sector whereas the process of liberalization culminated in the textile policy of 2000. The Multi-Fiber Agreement (MFA) of 1974 exempted the textile and garments trade from

General Agreements on Tariff and Trade (GATT) disciplines, allowing industrial countries to place bilateral quota on imports of various textile and garment product categories. This was meant to protect producers to restructure to compete with cheaper imports. During the Uruguay Round of trade negotiations, it was agreed to phase out of MFA gradually through the implementation of the Agreement on Textile and Clothing (ATC) on January 1, 2005. The MFA was fully phased out and hence the trade in textiles and garments will no longer be subject to quotas (Hashim, 2005).

**Structure of India's Textile Industry**

The industry today is divided into three segments:

1. Cotton Textiles
2. Synthetic Textiles
3. Other product like Wool, Jute, Silk etc.

All segments have their own place but even today cotton textiles continue to dominate with 73 percent share. The structure of the textile industry is extremely complex with the modern, sophisticated and highly mechanized mill sector on the one hand and hand spinning and hand weaving (handloom sector) on the other. In intermediate range, falls the decentralized small scale power loom sector.

Unlike other major textile-producing countries, Indian textile industry is comprised mostly of small-scale, nonintegrated spinning, weaving, finishing, and apparel-making enterprises. This unique industry structure is primarily a legacy of government policies that have promoted labor-intensive, small-scale operations and discriminated against larger scale firms. Relatively large-scale mills that integrate spinning, weaving and sometime fabric finishing are common in other major textile-producing countries. In India, however, these types of mills account only 3 percent of output in the textile sector. About 276 composite mills presently operating in India are owned by the public sector located mostly in Gujarat and Maharashtra.

**Spinning**: Spinning sector is technology intensive and productivity is affected by the quality of cotton and the cleaning process used during ginning. Spinning is the process of converting cotton or manmade fiber into yarn to be used for weaving and knitting. These

mills are chiefly located in North India. It is the most consolidated and technically efficient sector in India's textile industry. In 2002-03, India's spinning sector consisted of about 1,146 small-scale independent firms and 1,599 larger scale independent units.

**Weaving and Knitting**: The weaving and knits sector lies at the heart of the industry. In 2004-05, of the total production 46 percent was cotton cloth, 41 percent was non-cotton including khadi, wool and silk and 13 percent was blended cloth. Three distinctive technologies used in the sector are handlooms, power looms and knitting machines. Weaving and knitting converts cotton, manmade, or blended yarns into woven or knitted fabrics. India's weaving and knitting sector remains highly fragmented, small-scale, and labour-intensive. This sector consists of about 3.9 million handlooms, 1.7 millions powers loom and just 137,000 looms in the various composite mills.Fabric finishing is another major industry activity, which includes dyeing, printing, and other cloth preparation prior to the manufacture of clothing, is also dominated by a large number of independent, small-scale enterprises. A total of 2300 units comprising 2100 independent units and 200 integrated units of spinning, weaving and knitting is currently operating in the country.

Apparel is produced by about 77,000 small-scale units classified as domestic manufacturers, manufacturer exporters, and fabricators (subcontractors). The industry is expected reach the level of US $ 115 billion by 2012. The clothing and apparel sub-sector is expected to grow at a rate of 16 percent in volume terms and 21 percent in value terms, and textiles exports are expected to grow at a rate of 22 percent in value terms, by 2012 of

**Major problems**

The cotton textile industry is reeling under manifold problems. The major problems are sickness which is widespread in the cotton textile industry. After the Engineering industry, the Cotton textile industry has the highest incidence of sickness due to acute power cuts and labour shortage . As many as 125 sick units have been taken over by the Central Government in recent past. The sickness is attributed mainly to the obsolete power cuts and labour shortage, Government regulation, low yield and fluctuating output level, competition for man-made fibers from within and abroad, labour problem, stock planning and finally

ancillary factors such as power cuts, lack of finance, exorbitant rise in raw material prices and production cost etc.

Textile exports play a crucial role in the overall exports from India. Textile exports increased substantially from US$ 5.07 billion in 1991-92 to US$ 12.10 billion during 2000-01. The world textile trade has risen to 3.1 percent in 1999-2000 as against 1.80 percent in Z``early nineties. Indian textile exports have grown at an average of 11 percent per annum over the last few years, while world textile trade has grown only about 5.4 per cent per annum in the same period. During the year 2000-01 India's textile export was US$ 12014.4 million. It has increased to US$ 13038.64 million in 2004-05. The share of textile exports (including handicrafts, jute, and coir) was 24.6 percent of total exports in 2001-2002, however this percentage decreased to 16.24 percent during 2004-2005. The textile exports recorded a growth of 15.3 percent in 2002-2003 and 8.7 percent in 2003-2004. In 2004-05 textile exports were US$ 13,039.00 million, recording a decline of 3.4 percent as compared to the corresponding period of previous year. Against a target of US$ 15,160 million during 2004-05, the textile exports were only of US$13039 million, registering a shortfall of 14 percent against the target. The overall export target for 2005-06 has been fixed at US$ 15,565 million. In 2005 textile and garments accounted for about 16 percent of export earnings. India's textile exports to the US have shown a good rise of 29.5 percent between January and June 2005.

**Need for the Study**

Existing literature on Textile Industry is proliferous. However, at the disaggregate level; there are important analytical gaps that need to be filled. They address to Inter-product group and Intra-product group studies, studies focusing on post-MFA scenario, studies on partial factor productivity, studies of technology and technical progress and studies on sources of productivity growth. Many studies published contradicting results on the impact of trade liberalization brought about by the phasing out of quotas on the growth, partial factor productivity and sources of productivity growth in textile industry in India was not categorical. Hence, there is a need to re-examine credibility of the data base and precision

of results. The present study examined exhaustively on Employment Growth in Indian textile industry during pre and post-liberlisation perio.

Objective of the Study

The specific objectives of the study are;

1. To study inter and intra-product group employment growth in the pre and post-reform and post-MFA regime..

2. To suggest development employment strategies for the textile product manufacturing industry in India.

**Data and Methodology:** The study is based on secondary data, collected from the various issues of Annual Survey of Industries (ASI) published by Central Statistical Organization (CSO) Government of India.

The study covers the period from1980-81 to 2009-2010. All the textile manufacturing units covered by Annual Survey of Industries (ASI) have been included for the purpose of analysis. For the purpose of inter product group analysis, the product groups are classified as per 3 and 4 digits level of NIC (National Industrial Classification) code 1987, 1998 and data pertaining to all these units for the financial year from 1980-81 to 2009-10 have been collected. The entire period is divided into three phases as pre- liberalization period (1980-81 to 1991-92) post-liberalization period (1992-93 to 2005-06) and post MFA regime (2005-06 to 2009-10). There are 9 product groups as per three and four digits classification of NIC For the purpose of analysis, the collected data have been classified product group wise (3 and 4 digits classification of NIC code 1987 and 1998), over different years. The data in monetary terms are adjusted through suitable price indices to neutralize the price variations.

**Employment Growth**

There is unanimity amongst the scholars that the organized manufacturing sector registered “jobless growth” during the period from1980-81 to 1990-91. While the average annual rate of growth of gross value added during this period was about 8.66 percent the

corresponding average annual employment growth was merely 0.53 percent. The resultant employment elasticity was 0.06 (Kannan and Raveendran, 2009). The employment stagnation in the 1980s was also confirmed by the studies of World Bank (1989), Fallon and Lucas (1993), Papola (1994), Ghose (1994), Nagaraj (1994), Kannan (1994) Bhalotra (1998), Dutta Roy (1998) and Goldar (2000).

The growth of employment in the organized manufacturing sector during the 1990's has also been analyzed by a number of researchers and the general consensus has been that employment growth picked up considerably during the first half of the 1990s. Goldar (2000) showed that employment in the organized manufacturing sector registered an impressive growth of 4.03 percent during the period from 1990-91 to 1995-96 comparing favorably with the growth rate achieved in the 1970s (3.8 per cent). Kannan and Raveendran, (2009) again argue that for the period as a whole as well as for two separate periods – the pre and post reform phases – the picture that emerges is one of "jobless growth". One set of industries was characterized by employment creating growth while another set by employment displacing growth. Over this period there has been acceleration in capital intensity at the expense of employment generation.

Many studies argued that the effects of economic reforms on the employment situation in India have been pessimistic in the post-reform period also (Mundle 1992, 1993; Deshpande 1992; Bhattacharya and Mitra 1993, Agarwal and Goldar 1995; Kundu 1997). The impression that one would gather from these studies about the prospects of employment growth in manufacturing in the post-reform period is proven to be wrong by the marked acceleration that has taken place in employment growth in organized manufacturing in the 1990s. This is the background against which this section examines the employment implications of growth performance in terms of growth in employment so as to further probe the "jobless growth" phenomenon reported for earlier but shorter periods and to subject the examination of the growth and employment performance in terms of product groups to find if there are any discernible patterns in Indian textile industry.

**Employment Growth in Pre- Liberalization Period**

Table 1 presents the employment (total number of persons engaged) in the 9 textile product manufacturing industry in India during the pre-liberalization period.The Compound Growth Rate (CGR) has been computed by the World Bank Using Least Squares Method.

| Year / NIC | 140 | 1711 | 1712 | 1721 | 1722 | 1723 | 1729 | 1730 | 1810 | Textile Sector |
|---|---|---|---|---|---|---|---|---|---|---|
| **1980-81** | - | - | | - | - | - | - | - | - | - |
| **1981-82** | 175782 | 1382312 | 79614 | 5472 | 14852 | 9198 | 8301 | 14829 | 49514 | 1739874 |
| **1982-83** | 164354 | 1243298 | 86807 | 5239 | 16998 | 8117 | 7548 | 16994 | 49108 | 1598463 |
| **1983-84** | 177633 | 1305169 | 90841 | 5453 | 15161 | 7947 | 7513 | 17213 | 50020 | 1676950 |
| **1984-85** | 124212 | 1323029 | 90605 | 5081 | 16810 | 8657 | 7522 | 20408 | 52760 | 1649084 |
| **1985-86** | 116141 | 1317595 | 88845 | 4464 | 17384 | 10577 | 6810 | 18194 | 58391 | 1638401 |
| **1986-87** | 134766 | 1140331 | 103210 | 4734 | 11660 | 10528 | 7069 | 20408 | 60303 | 1493009 |
| **1987-88** | 133522 | 1147526 | 97240 | 4028 | 9396 | 9026 | 6048 | 19075 | 59141 | 1485002 |
| **1988-89** | 115480 | 1136836 | 100872 | 5356 | 9733 | 11033 | 8089 | 26463 | 70790 | 1484652 |
| **1989-90** | 117091 | 1088444 | 89945 | 6210 | 8168 | 10991 | 6675 | 20704 | 84200 | 1432428 |
| **1990-91** | 134853 | 1127639 | 103939 | 6638 | 13328 | 13019 | 7764 | 30307 | 94832 | 1532319 |
| **1991-92** | 124824 | 1105508 | 100480 | 5711 | 8459 | 16906 | 7477 | 33699 | 103375 | 1506439 |
| **Total** | 1518658 | 13317687 | 1032398 | 58386 | 141949 | 115999 | 80816 | 238294 | 732434 | 17236621 |
| **CGR %)** | -2.93 | -2.06 | 1.8 | 1.41 | -6.41 | 6.47 | -0.43 | 7.35 | 8.06 | 1.47 |

**Table:1 Employment growth during Pre-Liberalization Period**

Source: Calculated from ASI data

It is clear from the table 1 that there are wide fluctuations across the product group and year wise. The aggregate employment in terms of total number of persons engaged is 1739874 in 1981-82 which is the maximum and the minimum number of persons engaged is 1432428 in 1989-90. Among the product group the maximum number of persons engaged is 13317687 in the product group of the Manufacturing of Cotton Spinning and Processing other than in Mills (1711) and minimum number of person engaged is 58386 for the product group of Manufacturing of Fabrics or Plastic Sheeting, Manufacture of

made up Textile Articles (1721). The Compound Growth Rate in the number of people engaged during the pre-liberalization period isestimated tobe

**Employment in Post- Liberalization Period**

Table 2 provides the employment (total number of persons' engaged) in the 9 textile product manufacturing industry in India during the post-liberalization period

| Year / NIC | 0140 | 1711 | 1712 | 1721 | 1722 | 1723 | 1729 | 1730 | 1810 | Textile Sector |
|---|---|---|---|---|---|---|---|---|---|---|
| **1992-93** | 114668 | 1072389 | 96716 | 6931 | 5906 | 13107 | 9281 | 31859 | 115509 | 1466366 |
| **1993-94** | 135943 | 1083866 | 107220 | 8823 | 5270 | 11849 | 7555 | 36805 | 133909 | 1531240 |
| **1994-95** | 139582 | 1062669 | 134639 | 9758 | 10832 | 13949 | 8703 | 48677 | 190489 | 1619298 |
| **1995-96** | 129087 | 1075586 | 115915 | 9685 | 9156 | 17647 | 10112 | 50919 | 229878 | 1647985 |
| **1996-97** | 152828 | 1231939 | 124207 | 8677 | 9334 | 16820 | 9616 | 51771 | 250805 | 1855997 |
| **1997-98** | 159248 | 1145709 | 117731 | 9411 | 8362 | 20588 | 10944 | 59105 | 253036 | 1784134 |
| **1998-99** | 166776 | 1129759 | 144027 | 9928 | 10114 | 23208 | 11258 | 45531 | 273210 | 1813811 |
| **1999-00** | 115626 | 1061454 | 147168 | 13911 | 13335 | 16514 | 18929 | 58226 | 275540 | 1720703 |
| **2000-01** | 142967 | 966790 | 170959 | 21979 | 11517 | 30491 | 18912 | 62577 | 294746 | 1720938 |
| **2001-02** | 123528 | 936597 | 176155 | 26086 | 18562 | 24696 | 18985 | 87566 | 329401 | 1741576 |
| **2002-03** | 103568 | 881312 | 138218 | 23600 | 16635 | 20436 | 21116 | 80806 | 316223 | 1601914 |
| **2003-04** | 105357 | 844770 | 155801 | 20622 | 21068 | 26702 | 19031 | 90525 | 335050 | 1618926 |
| **2004-05** | 91979 | 803913 | 163758 | 33257 | 24712 | 26946 | 20449 | 137349 | 378542 | 1680905 |
| **Total** | 1789237 | 14099202 | 1977756 | 244849 | 189569 | 287378 | 206036 | 1002846 | 3825289 | 23622162 |
| **CGR (%)** | -2.46 | -2.8 | 4.16 | 13.95 | 11.73 | 6.06 | 9.05 | 10.98 | 8.76 | 6.61 |

**Table:2 Employment Growth during Post- Liberalization Period**

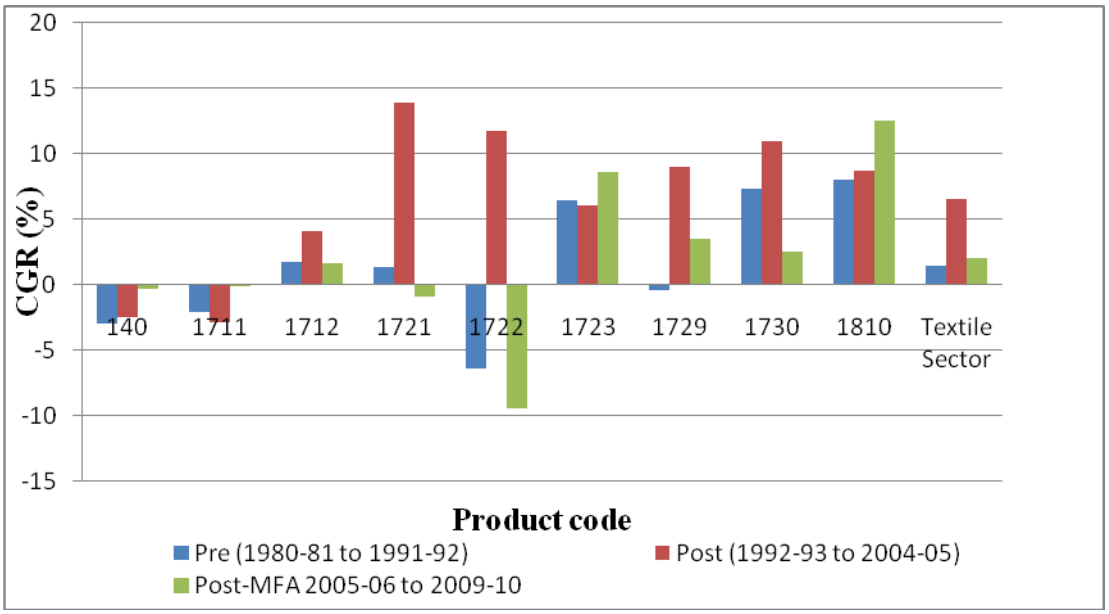
Source: calculated from ASI data

| Year / NIC | 0140 | 1711 | 1712 | 1721 | 1722 | 1723 | 1729 | 1730 | 1810 | Textile Sector |
|---|---|---|---|---|---|---|---|---|---|---|
| **2005-06** | 108080 | 802449 | 185242 | 42181 | 24766 | 24425 | 21145 | 161130 | 448951 | 1818369 |
| **2006-07** | 111895 | 859538 | 177272 | 28609 | 14385 | 29788 | 20466 | 127293 | 536445 | 1905691 |
| **2007-08** | 110584 | 844264 | 183067 | 31165 | 14563 | 31431 | 21557 | 139331 | 594877 | 1970839 |
| **2008-09** | 109288 | 829261 | 189051 | 33948 | 14743 | 33163 | 22706 | 152508 | 659673 | 2044341 |
| **2009-10** | 108007 | 814525 | 195230 | 36980 | 14925 | 34992 | 23917 | 166931 | 731527 | 2127034 |
| **Total** | 547854 | 4150037 | 929862 | 172883 | 83382 | 153799 | 109791 | 747193 | 2971473 | 9866274 |
| **CGR(%)** | -0.25 | -0.06 | 1.71 | -0.92 | -9.41 | 8.61 | 3.56 | 2.55 | 12.56 | 2.04 |

The table 2 shows that there are wide fluctuations across the product group and in different years during the post-liberalization period. The aggregate employment in terms of total number Persons engaged among the years, maximum number of persons engaged is 1855997 in 1996-97 and minimum number of persons engaged is 1466366 in 1992-93. Among the product group the maximum number of persons engaged is 14099202 in the product group of Manufacturing of Cotton Spinning, Processing other than in Mills (1711) and minimum number of person engaged is 189569 for the product group of Manufacturing of Fabrics or Plastic Sheeting, Manufacturing of Making of Blankets and Shawls (1722). The Compound Growth Rate in the number of persons engaged during the post-liberalization period is estimated to be 6.61 percent.

**Figure: 1**

**Growth Rate in Employment in Indian Textile industry in the Pre-Liberalization, Post-Liberalization and Post-MFA regime**




Source: Growth rate (%) from table No 4.7, 4.8 and 4.9

The analysis of growth rate in employment for the pre- liberalization (1980-81 to 1991-92), post-liberalization (1991-92 to 2004-05) and post-MFA regime (2005-06 to 2009-10) shows that they are 1.47 percent and 6.67 percent and 20.04 percent respectively

## Conclusion and Recommendations

In the case of employment growth, the post-liberization scenario of the industry is surprisingly better with 6.61 annual average growths than the pre-reform period. The annual average growth rate was 2.04 percent during post-MFA regime; we noted here that the negative growth in employment is due to the labour saving technological advancement in the Indian textiles industry.

Even after the implementation of various textile policies in India, Textile sector is facing increased competition from the multinational companies and survival of the fittest has been the buzz-word against the backdrop and in the light of the present study, the following strategies are recommended promotion of the textile sector in India.

There is also a need to encourage large-scale production, particularly in man-made and garment sectors, flexible labour laws, easy entry exit norms for the firms are some of the basic policy measures which would help the Indian textile and garment industry become more cost effective. Further, it would be prudent to focus on selected states having comparative advantage in a specific industry. Such measures could help convert the post MFA challenges into an opportunity rather than a threat.The study reveals that competition has improved the performance of the industry. In a competitive environment the share of labour input is higher in most of the product groups followed by capital, Therefore the results emphasize the importance of skilled labour component for the industry. The problem of shortage of power is wide spread throughout the country and the textile units are hit hard by this. The government should take care of this and assure uninterrupted power supply as provided to the large scale units.

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# The Impact of Advertising on Business

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## ABSTRACT

Advertising is one of the most important things present in or society today. Advertising helps to keep the consumers informed about whatever new products or services are available in the market at their disposal. It helps to spread awareness about products or services that are of some use to consumer and potential buyers. In the modern business society advertisement is a heart of the business, so each and every firm should concentrate in the effective advertisement strategy to attract the different level of age groups. The good advertisement should follow the advertisement ethics. Due to highly competitive nature of market and change in customer response pattern, the agencies of today not only make print or TV ads, but also are involved in identifying alternative avenues of communications for more effective use of their ad-budgets to become more than a single service provider. Known as " 360- degree approach" or Below the The Line (BTL) or Through The Tine (TTL) activities, these include rural marketing, entertainment, events, outdoor and health care Promotions**. Social media advertising offers a potentially unique advertising opportunity.** As a general trend, personalized advertisements are gaining popularity for a wide range of products and services.


**Keywords:** Advertising, Social media, Health care Promotions**.**

## INTRODUCTION

In ancient times the most common form of advertising was by word of mouth. Advertising is the life of trade. Advertisements can be placed on a variety of media. Television, radio, magazines and newspapers dominated the advertising world throughout the 20th century, but the Internet has continued to gain popularity among advertisers since its initial rapid growth in the 1990s. Advertising is not limited to media options; ads can be placed in physical locations, such as billboards and shop windows, as well. As advertising media changes, business practices change in response, ensuring that the business world, and specifically marketing departments, never lies stagnant.

## ADVERTISING

Advertising is everywhere, from television to billboards, newspapers and the Internet. Items are sold through effective advertising, which helps businesses and also stimulates the economy.

"Advertising is the nonpersonal communication of information usually paid for and usually persuasive in nature about products, services of ideas by identified sponsors through the various media".

## ETHICS OF ADVERTISING

### *General*

- Principles of the moral order must be applied to the domain of media
- Human freedom has a purpose: making an authentic moral response. All attempts to inform and persuade must respect the purposes of human freedom if they are to be moral.
- Morally good advertising therefore is that advertising that seeks to move people to choose and act rationally in morally good ways; morally evil advertising seeks to move people to do evil deeds that are self-destructive and destructive of authentic community
- Means and techniques of advertising must also be considered: manipulative, exploitative, corrupt and corrupting methods of persuasion and motivation

### *Three Specific Moral Principles of Advertising Ethics*

- RESPECT TRUTHFULNESS (Deception Objection)
    - Never directly intend to deceive
    - Never use simply untrue advertising
    - Do not distort the truth by implying things that are not so or withholding relevant facts
    - "Puffery" is acceptable where it is consonant with recognized and accepted rhetorical and symbolic practice
- RESPECT THE DIGNITY OF EACH HUMAN PERSON (attacks autonomy objection)
    - Do not exploit our "lower inclinations" to compromise our capacity to reflect or decide either through its content or through its impact: using appeals to lust, vanity, envy and greed, and other human weakness.
    - Give special care to the weak and vulnerable: children, young people, the elderly, the poor, and the culturally disadvantaged.

- RESPECT SOCIAL RESPONSIBILITIES (promotes consumption, empties communication, objections)
    - Example: Concern for the ecology—advertising should not favor a lavish lifestyle which wastes resources and despoils the environment
    - Example: Advertising should not reduce human progress to acquiring material goods and cultivating a lavish lifestyle

## THE IMPACT OF ADVERTISING ON BUSINESS

- **Purpose**

Advertising strategies serve a variety of purposes. For new companies, brands or products, ads can serve to inform customers about the new product and stimulate interest in the marketplace. For existing players, ads can remind customers of the product's value, suggest new uses for the product or encourage repeat purchases through promotions.

- **Competitive Advantage**

Advertising can have a large impact on new businesses by creating large barriers to entry in established markets. Well-known companies with large advertising budgets and market-wide name recognition can have a significant competitive advantage over fledgling competitors. Companies with large budgets can also create counter-campaigns to negate the effects of new companies' advertising efforts.

- **Considerations**

Businesses can choose to produce advertisements in-house using the expertise of the owner or by employing specialists in their marketing departments or to use the services of an advertising agency. The importance of advertising to all types of businesses has given rise to an entire industry of professional advertising consultants and ad production agencies. Using an ad agency can help you to produce high-impact advertising campaigns, but the cost can be high for newer companies.

- **Future**

As a general trend, personalized advertisements are gaining popularity for a wide range of products and services. Intelligent ad placement mechanisms, such as Google's AdWords and Facebook ads, ensure that ads are viewed by the right people, maximizing the efficiency of advertising expenses. Advertisements sent to email and cellular phones can also be highly

personalized, sending the viewers ads that for products complementary to things they have recently purchased.

- **Information**

Advertisement supplies consumers with information about products and services. This information is broadcast for the open market, and discusses specials, sales, and new lines of products and services. A consumer also learns about the comparisons between features, benefits and options of different products and services through advertisement.

- **Brand Identity**

Brand identity is one of the biggest functions and effects of advertisement. By selling products and services through advertisements, businesses differentiate themselves from one another. The right advertising campaign defines a company's unique brand, which helps consumers build emotional relationships with that brand. This increases the likelihood that consumers will buy from that company.

- **Purchase Persuasion**

Powerful and captivating advertisements persuade consumers to purchase a new product, try out services, and fulfill voids they feel are present in their lives. In fact, persuasion is one of the main functions of advertising, which is why many firms strive to create powerful impacts that reach customers on emotional and physical levels.

- **Education**

Advertising serves as a form of consumer education. Not all advertisements sell a product or service; sometimes they sell a concept. Government agencies use advertisement as a way to educate and compel consumers to act a specific way. "The Social and Cultural Effects of Advertising" notes that advertising is geared toward the ideas of art, religion, sexual attraction and myth. Advertising also educates consumers on what products and services out are there, how much they should pay, and what they can expect with certain purchases.

## SOCIAL MEDIA ADVERTISING

Social media marketing programs usually centre on efforts to create content that attracts attention and encourages readers to share it with their social networks. The resulting electronic word of mouth (eWoM) refers to any statement consumers share via the Internet (e.g., web sites, social networks, instant messages, news feeds) about an event, product, service, brand or company.

The main advantage of social media marketing is cost-related. The majority of social media sites are free to access, create a profile and post information. The advantage of reaching your targeted market for little or no cash investment is substantial, and the audience wanting your information voluntarily joins or follows you. Pay-per-click advertisements on sites such as Facebook are "geo-targeted" according to specific criteria, to reach the correct audience. The viral nature of social media means that each person who reads your posts has the capability to spread the news farther within his own network, so information can reach a large number of people in a short time.

## SOCIAL MEDIA PLATFORMS

Facebook and Twitter are the social media platforms most commonly used for marketing. Facebook offers the option of creating a fan page for a company or product, while Twitter makes use of 140-character posts that users follow. Blogs are online journals written by users, which can be influential in spreading news and information. YouTube is a repository for podcasts and video clips, with a viewership of millions around the globe. Social bookmarking sites such as Delicious and Digg enable users to share links to information with friends and followers. Some sites offer display advertising options, but the majority are simply a method of sharing information with others.

## MOST POPULAR SOCIAL NETWORKING SITES

- Twitter

- Facebook
- LinkedIn
- Yelp
- Foursquare
- Instagram
- YouTube
- Delicious & Digg
- Blogs
- Meetup
- Myspace
- Ning
- Classmates
- Tagged
- Pinterest
- Foursquare
- Reddit

**CONCLUSION**

Advertising campaign involves designing a series of advertisements and placing them in various advertising media to reach a desired target group. There is a recent trend that advertising and its messages along with signature songs, puch lines etc. are gaining too much popularity so that the people began to enjoy them as pure form of entertainment without having any effect on them in their attitude and behavior. The Internet has reduced the cost and increased the speed of information transfer. This has transformed the economic landscape, allowing new and exciting ways to generate revenue that include and differ from traditional economic models. Advertising is a using powerful media to control peoples' choices. We also have power, the power to choose, the power to think for ourselves, and the power to influence others. How we use that power is central to the creation of good and healthy society. If we allow others to control us without employing our power, we give up too much. If we allow others to misuse their power in our society we allow them to determine the future for us.

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# GUERRILLA MARKETING

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**Abstract:**

Guerrilla marketing is an advertisement strategy concept designed for small businesses to promote their products or services in an unconventional way with little budget to spend. This involves high energy and imagination focusing on grasping the attention of the public in more personal and memorable level. Some large companies use unconventional advertisement techniques, proclaiming to be guerrilla marketing but those companies will have larger budget and the brand is already visible. The main point of guerrilla marketing is that the activities are done exclusively on the streets or other public places, such as shopping centers, parks or beaches with maximum people access so as to attract much audience.

**Key Words:** Guerilla marketing, low cost, audience, strategy, Blair Witch Project.

## Introduction

**Guerrilla Marketing** is an advertising strategy that focuses on low-cost unconventional marketing tactics that yield maximum results.

The original term was coined by Jay Conrad Levinson in his 1984 book 'Guerrilla advertising'. The term guerrilla marketing was inspired by guerrilla warfare which is a form of irregular warfare and relates to the small tactic strategies used by armed civilians. Many of these tactics includes ambushes, sabotage, raids and elements of surprise. Much like guerrilla warfare, guerrilla marketing uses the same sort of tactics in the marketing industry. This alternative advertising style relies heavily on unconventional marketing strategy, high energy and imagination. Guerrilla marketing is about taking the consumer by surprise, make an indelible impression and create copious amounts of social buzz.

Guerrilla marketing is said to make a far more valuable impression with consumers in comparison to more traditional forms of advertising and marketing. This is due to the fact that most guerrilla marketing campaigns aim to strike the consumer at a more personal and memorable level. Guerrilla marketing is often ideal for small businesses that need to reach a

large audience without breaking the bank. It also is used by big companies in grassroots campaigns to compliment on-going mass media campaigns. Individuals have also adopted this marketing style as a way to find a job or more work.

**Guerrilla Marketing: The scenes behind**

Advertising can be dated back to 4000 BC where the early Egyptians used papyrus to make sales messages and wall posters. What we consider traditional advertising and marketing slowly developed over the centuries but never really boomed until the early 1900s. It was at this time that the main goals of advertisements were to educate the consumer on the product or service rather than to entertain and engage them. In 1960, campaigns focuses on heavy advertising spending in different mass media channels such as radio and print.

It wasn't till the late 1980s and early 1990s that cable television started seeing advertising messages. The most memorable pioneer during this time was MTV which they focused on getting the consumer to tune in for the advertising message rather than it being the by-product of a featured show. Agencies struggled to make an impression on consumers and consumers were tired of being marketed to. It was time for a change.

In 1984, marketer Jay Conrad Levinson introduced the formal term in his book called, "Guerrilla marketing."Levinson comes from a background as the Senior Vice-President at J. Walter Thompson and Creative Director and Board Member at Leo Burnett Advertising. In Levinson's book, he proposes unique ways of approaching and combating traditional forms of advertising. The goal of guerrilla marketing was to use unconventional tactics to advertise on a small budget. During this time, radio, television and print were on the rise, but consumers were growing tired. Levinson suggests that campaigns need to be shocking, unique, outrageous and clever. It needs to create buzz. Small businesses started changing their ways of thinking and approached marketing in a brand new way. The concept of guerrilla marketing continues to develop and grow organically.

**Risk But Success Ideology at large**

Guerrilla marketing originally was a concept aimed towards small businesses with a small budget, but this didn't stop big businesses from adopting the same ideology. Larger

companies have been using unconventional marketing to compliment their advertising campaigns. Some marketers argue that when big businesses utilize guerrilla marketing tactics, it isn't true guerrilla. Bigger companies have much larger budgets and their brands are usually already well established. It can also be far more risky for a big business to do guerrilla marketing tactics. In some instances, their guerrilla stunts can flop and ultimately become a PR nightmare. Smaller businesses don't run as much risk as most people will just write it off as another failed stunt.

One such example would be the famous 2007 Boston Bomb Scare caused by Turner Broadcasting on January 31, 2007. What started off as a guerrilla marketing campaign to promote a new film featuring a Cartoon Network show called Aqua Teen Hunger Force, turned into a citywide bomb scare. Turner Broadcasting with the help of guerrilla marketing agency, Interference, Inc., placed battery-powered LED placards resembling the 'Mooninite' character on the cartoon show. The LED placards were placed throughout Boston, Massachusetts and the surrounding cities.

The placards were placed in random locations and remained unlit during the day. At night the placards lit up to show the 'Mooninite' character putting up his middle finger. The devices resembled some characteristics of explosive devices and soon caused the scare. The campaign ended up costing Turner Broadcasting and Interference, Inc. $2 million for the incident. The campaign itself received a lot of criticism both good and bad.

"Nobody could have conceived that Lite-Brite cartoon character was going to evoke a bomb scare. Once you take the emotion out of it, it was a really innovative campaign. That's what people will remember. Many of the brands we work with are asking us for guerrilla marketing campaigns, with an element of mystery, but they don't really understand what it means. Ewen could elevate this experience into something for the industry to learn from, counseling on what it means. He should be out there speaking about this to industry groups." – Donna Sokolsky, Co-Founder of Spark PR in San Francisco.

In January 2010, The Coca-Cola Company created the "Happiness Machine" video with the help of interactive marketing agency. The video featured a Coca-Cola vending machine that dispensed a lot more than just a cold beverage. The film was shop at St. John's University in

Queens, New York, using 5 strategically placed hidden cameras. The reactions from the students were completely unscripted. The video went viral and now has over **4.5 million views** on YouTube. In May 2010, it won a prestigious CLIO Gold Interactive Award. The film had the highest penetration in Brazil, Mexico, Japan and Russia. After seeing the amazing ROI on this video, Coca-Cola decided to continue the 'Happiness' theme by releasing several other videos using the same concept.

On October 14th, 2012, Red Bull and Austrian extreme athlete Felix Baumgartner set a world record for the highest skydiving jump. The Red Bull Stratos was a campaign to send Baumgartner on a death defying jump at over 128,100 feet into the stratosphere. Baumgartner broke the speed of sound reaching an estimated speed of 833.9 mph (1,342.8 km/h) after jum[ing out of a helium-filled balloon. The entire trip back to earth lasted 9:09 minutes with 4:22 of that time in freefall. More importantly, Red Bull attracted much deserved attention for this grand stunt. On this day, they also broke social media records when they reached **over 8 million confirmed concurrent views on YouTube**. The team achieved this with several grand efforts on their social media team. By visiting the Red Bull Stratos website, users could tune in to the jump LIVE, stay engaged via the twitter stream and a connect with others on Facebook.

**Blair Witch Project**

Guerrilla marketing may be the right solution for your small business. When executed well, it will often be low cost yet reach a highly targeted audience. It can also be a great way to get noticed, distinguish from the competition and earn a reputation for being fun and different. In an interview with Entrepreneur magazine, several guerrilla marketing agency experts divulged that good guerrilla marketing is unauthorized and disruptive and also stick more over it is a kind of Street Attack ( Brett Zaccardi,).Brand activation that isn't 100 percent permitted by the city, event or establishment (Adam Salacuse, Founder and President of ALT TERRAIN)

One of the most famous examples is The Blair Witch Project, a film that was promoted using guerrilla marketing efforts. The Blair Witch Project is a 1999 American psychological horror film that was produced by five graduates of the University of Central Florida Film Program with a minimal budget and a camera. The two set up an internet campaign to spread rumors about a fictitious legend of "the Blair Witch." The duo created a website devoted to the

Blair Witch to help support the case for this fictitious woods-based specter. They ran with the tagline, "In October of 1994, three student filmmakers disappeared in the woods near Burkittsville, Maryland, while shooting a documentary. A year later, their footage was found."

In April 1998, the preview aired on Bravo and it drew a lot of attention. The producer of the Bravo show Split/Screen asked the duo to build a stand-alone website, because Blair Witch comments were dominating its own site and discussion board. There were people interested in this and the film wasn't even done."That's how the whole thing started. The website launched in the summer of 1998 and in November, we found out we were accepted into Sundance Film Festival. We had all this buzz going into Sundance. It was not because we spent money. It was because we had fans already, who hadn't even seen the film. It was eye-opening," says Mike Monello, a co-creator of The Blair Witch Project. The Blair Witch Project grossed $248,639,099 worldwide.

**Six Great Campaigns**

Each year, America spends about $250 billion on marketing and advertising — more than the entire GDP of Thailand. Too bad most of that money is a complete waste. For an increasingly savvy, TiVo-equipped public, our brains seem to shut down whenever something registers as "advertising." Which means all those marketing creative's at the big ad firms have had no choice but to, well, get more creative. Some advertisers have relied on product placement (think James Bond stopping mid-gunfight for a refreshing sip of Heineken). Others have attempted to make their ads so entertaining that People will watch them in spite of the sales pitch. And then there's the more mischievous route — the grassroots, take-it-to-the-streets method — and that's where guerrilla marketing comes in.

Dirt-cheap and chock full of trickery, guerrilla marketing is advertising with a wink. The successful campaigns usually corral attention through subversive means before revealing their true purpose, and they distinguish themselves by being so clever that even once the bait and switch is revealed, there's no negative outcry. In other words, even though consumers know they've been duped, the reaction amounts to nothing more than a bashful, "Oh Pepsi! We can't stay mad at you!"And it's with that good-humored and awe-inspired mindset that we pay homage to the best "gotcha" moments in advertising.

- **The Blair Witch Project**
- **Medicines du Monde**
- **Half.com**
- **Acclaim Entertainment**
- **Vodafone**
- **Obey: Andre the Giant Has A Posse**

## Conclusion

Many online marketing strategies also use social media such as Facebook and LinkedIn to begin campaigns, share-able features and event host events. Other companies run competitions or discounts based on encouraging users to share or create content related to their product. Viral videos are an incredibly popular form of guerrilla marketing in which companies film entertaining or surprising videos that internet users are likely to share and enjoy, that subtly advertise their service or product. Some companies such as Google even create interactive elements like the themed Google logo games to spark interest and engagement. This dynamic guerrilla marking tactics can become news globally and give businesses considerable publicity. Guerrilla marketing is at low cost and easily reachable. But it is introduced for the small scale business but it is utilized by all.

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# Kisan Credit Card Scheme in India

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## Introduction

Agriculture is the backbone of the Indian economy, with nearly 67 per cent of the population of the country continuing to depend on it either directly or indirectly for their livelihood (RBI, 2005)[1]. Agriculture continues to be an important sector of the economy with 18 per cent share in the Gross Domestic Product (NABARD 2010)[2]. Keeping in view the significance of the primary sector in its export earnings, in providing food security and in supplying adequate inputs to the feeder industries of agriculture such as the textiles, sugar, rice and flour mills, the milk industries and the like, any policy change in this sector, positive or negative, would cause a multiplier effect in the entire economy (Tripathi and Jain 2007)[3].

Considering the dominant role of the sector and the importance of credit as an input, a multi-agency approach has been adopted by the Reserve Bank of India (RBI) for ensuring credit flow to the sector. In spite of several improvements in the delivery systems that have been undertaken over time, making institutional credit available to a large number of farmers, particularly small and marginal farmers, continues to be a challenge to the banking industry. Financing for agriculture has been a gigantic task for banks, given the enormity of the credit requirements on the one hand and vagaries of nature on the other. Provision of timely, adequate and hassle-free credit to farmers continues to be one of the major tasks for banks in India.

Both RBI and National Bank for Agriculture and Rural Development (NABARD) have taken several initiatives for simplification of systems and procedures and designing of innovative credit delivery products in dispensation of agricultural credit. In this context, the Kisan Credit Card (KCC) scheme introduced in 1998-99 was a step towards facilitating the access to Short Term (ST) credit for the borrowers from the financial institutions. The scheme was conceived as a unique credit delivery mechanism, which aimed at provision of adequate and timely supply of ST credit to the farmers to meet their crop production requirements.

**Kisan Credit Card Scheme – Major Features:** KCC Scheme was a step towards facilitating the access to short term credit for the farmers from the financial institutions to meet their crop

production requirements which includes purchase of agriculture inputs like seeds, fertilizers, pesticides etc. A credit card and a pass book or a credit card cum pass book incorporating the name, address, particulars of land holdings, borrowing limit, validity period, are issued to beneficiaries covered under this scheme. It may serve both as an identity card and facilitate recording of transactions on an ongoing basis. This scheme mainly helps farmers for the purchase of inputs during the cropping season. The farmer to be covered under this scheme is evaluated by the bank on financial basis by looking at his past record with the bank, and on personal grounds by assuming at his reputation in the village or town. Operational land holdings may also be the bases for fixing the credit limit under the card. To cover the KCC holders against any accidental death or permanent disability or partial disability up to Rs.50,000 and Rs.25,000, respectively, an insurance scheme had been formulated by the General Insurers' (Public Sector) Association of India (GIPSA) in close co-ordination with the NABARD. In this connection, the present study is concerned with exploration of Kisan Credit Card Scheme and analyses the progress made by banks under this scheme.

**Progress of Kisan Credit Card Scheme in India** Table 1 shows the progress made in the issue of KCC in India, according to the various agencies over a period from 1998-1999 to 2010-2011.

**Table 1**

**Kisan Credit Cards (KCC) Issued and the Amounts Sanctioned by the Various Credit Agencies**

**(Amount Sanctioned in Crores and No. of Cards Issued in Million)**

| Year | Cooperative Banks | | RRBs | | Commercial Banks | | Total | |
|---|---|---|---|---|---|---|---|---|
| | No. of Cards | Amounts Sanctioned | No. of Cards | Amounts Sanctioned | No. of Cards | Amounts Sanctioned | No. of Cards | Amounts Sanctioned |
| 1998- | 1.55 | 826 | 0.06 | 11 | 6.22 | 1473 | 7.84 | 2310 |
| 1999- | 35.95 | 3606 | 1.73 | 405 | 13.66 | 3537 | 51.34 | 7548 |
| 2000- | 56.14 | 9412 | 6.48 | 1400 | 23.90 | 5615 | 86.52 | 16427 |
| 2001 - | 54.36 | 15952 | 8.34 | 2382 | 30.71 | 7524 | 93.41 | 25858 |
| 2002- | 45.79 | 15841 | 9.64 | 2955 | 27.00 | 7481 | 82.43 | 26277 |
| 2003- | 48.78 | 9855 | 12.73 | 2599 | 30.94 | 9331 | 92.47 | 21785 |
| 2004- 2005 | 35.56 | 15597 | 17.29 | 3833 | 43.96 | 14756 | 96.80 | 34186 |
| 2005- | 25.98 | 20339 | 12.49 | 8483 | 41.65 | 18779 | 80.12 | 47601 |
| 2006- | 22.98 | 13141 | 14.06 | 7373 | 48.08 | 26215 | 85.11 | 46729 |
| 2007- 2008 | 20.91 | 20492 | 17.73 | 9074 | 46.06 | 20421 | 84.70 | 49987 |
| 2008- 2009 | 13.44 | 13172 | 14.14 | 7632 | 58.34 | 25865 | 85.92 | 46669 |
| 2009- 2010 | 17.50 | 7606 | 19.50 | 10132 | 53.10 | 39945 | 90.10 | 42774 |
| 2010- 2011 | 28.10 | 10719 | 17.70 | 11468 | 55.80 | 50438 | 101.60 | 72625 |
| **Total** | **407.04 (39.20)** | **156558 (35.52)** | **151.89 (14.63)** | **67747 (15.37)** | **479.42 (46.17)** | **231380 (52.49)** | **1038.36 (100.00)** | **440776 (100.00)** |

Note: Figures in brackets are percentages to total cards issued and to total amounts sanctioned.

Source: ***NABARD Annual Report, Various Issues.***

Table 1 had shown that the total number of Kisan Cards issued by all the various agencies put together had amounted to 1038.36 lakhs during the period 1998-1999 to 2010-2011. Of the total number of cards issued, the cooperative banks alone had issued a number of 407.04 lakhs of cards (39.20 per cent). The commercial banks had issued 479.42 lakhs of cards (46.17 per cent) and the remaining 151.89 lakhs of the cards had been issued by the RRBs (14.40 per cent).

The share of the commercial banks in the total amounts sanctioned had accounted for 52.49 per cent and the share of the cooperative banks and the RRBs had accounted for 35.52 per cent and 15.37 per cent respectively. Further, it could be understood that the commercial banks had dominated among the various agencies, both in terms of the total number of cards issued and in respect of the total amounts sanctioned during the ten year period of 1998-1999 to 2010-2011.

**Region-wise Progress of Kisan Credit Card Issued**

The following Table 2 had shown that the Region-wise analysis of total number of KCC issued by various financial agencies during the year 2011-2012, revealed that Southern Region accounted for 27.89 per cent of the total cards issued followed by, Central Region (27.41 per cent), Eastern Region (20.63 Per cent). The share of North Eastern Region in terms of KCC issued only 3.38 per cent.

Further, it could be understood that the commercial banks had dominated among the various agencies in various regions, both in terms of the total number of cards issued and in respect of the total amounts sanctioned during the year 2011-2012.

**Table 2**

**Region-wise Progress of Kisan Credit Card Issued during 2011-2012**

**(Amount in Rs in Billion and No. of Cards Issued in '000)**

| Sl. No. | Name of the Region | Cooperative Banks | | RRBs | | Commercial Banks | | Total | |
|---|---|---|---|---|---|---|---|---|---|
| | | Cards Issued | Amount Sanctioned | Cards Issued | Amount Sanctioned | Cards Issued | Amount Sanctioned | Cards Issued | Amount Sanctioned |
| 1 | Northern Region | 189 | 9.8 | 188 | 26.1 | 745 | 152.7 | 1122 (9.54) | 188.6 (20.58) |
| 2 | North-Eastern Region | 31 | 0.3 | 130 | 2.8 | 236 | 7.8 | 397 (3.38) | 10.9 (1.19) |
| 3 | Western Region | 333 | 10.2 | 83 | 4.1 | 895 | 93.0 | 1311 (11.15) | 107.3 (11.71) |
| 4 | Central Region | 1192 | 57.9 | 682 | 42.8 | 1349 | 147.4 | 3223 (27.41) | 247.9 (27.05) |
| 5 | Southern Region | 419 | 17.3 | 352 | 17.7 | 2509 | 243.2 | 3280 (27.89) | 278.1 (30.35) |
| 6 | Eastern Region | 797 | 11.0 | 560 | 21.6 | 1070 | 50.9 | 2427 (20.63) | 83.5 (9.11) |
| | **Total** | **2916** | **106.4** | **1995** | **115.2** | **6804** | **695.1** | **11760 (100.00)** | **916.3 (100.00)** |

**Source:** NABARD.

Note:

Northern Region : Haryana, Himachal Pradesh, Jammu and Kashmir, New Delhi, Punjab, Rajasthan, Chandigarh.

North-Eastern Region : Assam, Arunachal Pradesh, Meghalaya, Mizoram, Manipur, Nagaland, Tripura, Sikkim.

Western Region : Gujarat, Maharashtra, Goa, Daman and Diu, Dadra and Nagar Haveli.

Central Region : Uttar Pradesh, Uttarkhant, Madhya Pradesh, Chhattisgarh.

Southern Region : Karnataka, Kerala, Tamilnadu, Lakshadweep, Pondicherry.

Eastern Region : Odisa, West Bengal, Andaman and Nicobar Islands, Bihar, Jharkhand.

## Conclusion

Kisan credit card has emerged as an innovative credit delivery mechanism to meet the production credit requirements in a timely and hassle free manner. Realizing its potential for simplifications of loan procedures and in reducing the drudgery of cumbersome documentations to issue the Kisan Credit Cards to farmers on the basis of their holding for uniform adoption by the banks so that the farmers may use them to readily purchase agricultural inputs and draw cash for their production needs.

The performance of the KCC scheme has been found to vary across different regions of the country and across financial institutions. The North and North-Eastern regions continue to be underperformers with respect to KCC during the year 2011-2012. Further, it could be understood that the commercial banks had dominated among the various agencies, both in terms of the total number of cards issued and the total amounts sanctioned during the study period.

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# SWOT ANALYSIS OF FACEBOOK

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**Abstract:**

With over 800 million active users, Facebook is changing the way hundreds of millions of people relate to one another and share information. Facebook has affected the social life and activity of people in various ways. With its availability on many mobile devices, Facebook allows users to continuously stay in touch with friends, relatives and other acquaintances wherever they are in the world, as long as there is access to the Internet. It can also unite people with common interests and/or beliefs through groups and other pages, and has been known to reunite lost family members and friends because of the widespread reach of its network. Recent studies have shown that Facebook causes negative effects on self-esteem by triggering feelings of envy, with vacation and holiday photos proving to be the largest resentment triggers. Other prevalent causes of envy include posts by friends about family happiness and images of physical beauty—such envious feelings leave people lonely and dissatisfied with their own lives.

**Keywords: Facebook, Internet, Face book:** Facebook is a popular free social networking website that allows registered users to create profiles, upload photos and video, send messages and keep in touch with friends, family and colleagues. The site, which is available in 37 different languages, includes public features such as:

- **Marketplace** - allows members to post, read and respond to classified ads.
- **Groups** - allows members who have common interests to find each other and interact.
- **Events** - allows members to publicize an event, invite guests and track who plans to attend.
- **Pages** - allows members to create and promote a public page built around a specific topic.
- **Presence technology** - allows members to see which contacts are online and chat.Facebook, Inc. is an internet corporation which runs the social networking website Facebook. Facebook became a public company after its record initial public offering (IPO) on February 2012. Facebook is the largest social networking website and has more than a billion active users. Facebook's mission is to make the world more open and connected.

## SWOT ANALYSIS OF FACE BOOK

Facebook SWOT analysis

| Strengths | Weaknesses |
|---|---|
| • Integration with websites and applications<br>• More than a billion active monthly users<br>• Excellent users experience<br>• Understanding of user's needs and behavior | • Weak CTR of advertisements<br>• Social network lacks of some features<br>• One source of revenues – advertisements on Facebook<br>• Attitude towards users' privacy<br>• Lack of website customization<br>• Weak protection of users' information |
| **Opportunities** | **Threats** |
| • Increasing number of people using Facebook through mobile devices<br>• Expansion to China<br>• Diversify sources of revenue<br>• Open Facebook marketplace | • Increasing number of mobile internet users<br>• Users using ad-block extensions<br>• Slow growth rate of online advertising<br>• Identity thefts<br>• Weak business model |

**Strength**

1. **Integration with websites and applications.** To enrich user experience and engage more users to use Facebook, the social network has launched many features that would allow closer integration with other websites and producers of applications that run via Facebook. Easy integration and use of applications results in competitive advantage over other social networking websites that struggle to provide the same level of service.
2. **More than a billion active monthly users.** For a social network to grow, it must have users. The more users the Facebook has, the more socially connecting it is. With one billion active monthly users, Facebook is able to connect people not only locally but globally as well.
3. **Excellent user experience.** Facebook has an easy to use interface, is integrated with many website, can connect people through PC or mobile devices, is translated into more than 70 languages and has many more additional features that lack other social networks.
4. **Understanding of user's needs and behavior.** Except Google, no other business has so many data collected on what users like, dislike, needs and how the users behave online. With so much data, Facebook knows what exactly to offer to its users (what additional features, what advertisements) and how to further improve their experience with Facebook.

**Weakness**

1. **Weak CTR of advertisements.** Facebook has a lower click-through-rate (CTR) than an average website, which is only 0.05% and about 4% respectively. In order to earn more income from the advertisements Facebook has to change the way it displays the ads (advertisements on wall posts have more than 6% CTR) but without interfering users' experience.
2. **Social network lacks of some features.** Although Facebook has a wide range of features that other social networks don't, the website still lacks: video chats, group chats, dislike buttons, ability to unsubscribe from alerts and many others.
3. **One source of revenues – advertisements on Facebook.** More than 80% of Facebook's revenues come from advertising on its social network. The growth of the revenues directly

depends on the growth of users. This leaves the business very vulnerable and dependent on continuous growth of users, which will eventually be only marginal as the social network has already attracted so many users.

4. **Attitude towards users' privacy.** Facebook collects private users' information and then stores it, uses it for its own purposes or sells it. Such treatment of users' private information draws negative attention that decreases popularity of Facebook.
5. **Lack of website customization.** Many Facebook's users spend a lot of time on social network and want the website to reflect their personalities but are unable to customize the website to their needs and are forced to use uniform template for all users. In comparison, Google+ allows for much more personalization of the social network account than Facebook does.
6. **Weak protection of users' information.** Facebook, having so many users that upload personal information to the social network, is a target for attacks that steal passwords and other personal information from the users. Such attacks occur every day and thousands of passwords are stolen. Though, Facebook is not doing enough to protect users' from identity attacks.

**Opportunities**

1. **Increasing number of people using Facebook through mobile devices.** Currently Facebook has more than 600 million users who use Facebook through mobile devices. Despite that this group makes 60% of all Facebook users, the mobile advertising only accounts for only 14% income for the company. Facebook has an opportunity to create a platform that could be used to display ads for mobile users and increase firm's income.
2. **Expansion to China.** Easing government regulations and newly elected government may open a way for Facebook to enter China's social networking market. Until then, Facebook should prepare itself for such an entry.
3. **Diversify sources of revenue.** Facebook heavily relies on advertising on its social network as a source of income, but with being the number 2 website in the world and more than 1 billion active monthly users, Facebook could exploit other opportunities to attract the money.

4. **Open Facebook marketplace.** With so many users and extensive coverage of the world, Facebook is well positioned to open Facebook marketplace. If successful, it would bring more revenues than the advertising, thus boosting company's growth and future prospects.
5. **Increasing number of people using Facebook through mobile devices.** Currently Facebook has more than 600 million users who use Facebook through mobile devices. Despite that this group makes 60% of all Facebook users, the mobile advertising only accounts for only 14% income for the company. Facebook has an opportunity to create a platform that could be used to display ads for mobile users and increase firm's income.
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8. **Open Facebook marketplace.** With so many users and extensive coverage of the world, Facebook is well positioned to open Facebook marketplace. If successful, it would bring more revenues than the advertising, thus boosting company's growth and future prospects.

**Threats**

1. **Increasing number of mobile internet users.** Currently Facebook has more than 600 million users who use Facebook through mobile devices. Despite that this group makes 60% of all Facebook users, the mobile advertising only accounts for only 14% income for the business. If the company will be unable to monetize mobile users, it will face decreasing advertising income as more PC users will turn to mobile users.
2. **Users using ad-block extensions.** Educated internet users often install extensions that block advertisements from the websites. The growing number of such users is threatening Facebook's model as they can't see advertisements and click on them.
3. **Slow growth rate of online advertising.** Although online advertising still grows in double digits (14% in 2012, down from 23% in 2011) that growth is slowing down, thereby threatening growth of Facebook's advertising income.

4. **Identity thefts.** Even today, identity thefts are common on Facebook. The more identities are stolen the more criticism Facebook will receive strongly damaging its brand for inability to protect users' private information.
5. **Weak business model.** Facebook's aim is to attract social network users, display the ads for them and charge the businesses for the ads displayed. Although Facebook's business model looks sound for the moment, the company may face severe difficulties if some conditions change that are not in firm's control. For example, slowing growth of online advertising, new social network, shift from advertising on Facebook to other websites, growing number of mobile users (Facebook is yet unable to monetize them) or failure to diversify source of income.

## Conclusions

The face book is an effective social media network to connect all over the world people in the world. It helps to identify the old friends and creating new friends. Each and every media has certain pros and cons but how the people utilizing the social benefits to mutually each other. The social media connects the people across the country, but some people use the media for some entertainment purpose, and others for advertising and improving the business. The face book helps to share some useful information related to education, business ideas, quotes, spiritual science, entertainment, games. The quantity usage of facebook depends on the mettle of its users.

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# Characterization of Metallic and Non-Metallic Materials by Scanning Acoustic Microscopy

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## Abstract

Scanning Acoustic Microscope (SAM) uses focused high frequency ultrasound to image and characterise the structural details of materials. It is used for microstructural characterisation, failure analysis, estimation of fracture toughness of ceramics and nondestructive evaluation. It has potential applications for elastic property characterisation, internal stress measurements and biological applications. A sophisticated SAM system has been procured first time in India, from M/s. KSI Germany during March 2007 and installed successfully at NDED. The operating frequency range of the system is 673 – 1023 MHz which corresponds to a spatial resolution of 1 µm. In a systematic study undertaken using SAM, to optimize the specimen preparation techniques for various materials have been optimized and surface and subsurface high resolution acoustic images of heat treated and sensitized AISI type 304 LN stainless steel and granites have been obtained and correlated.

## 1.0 Introduction

It is well known that, it is the microstructure of the material that controls the bulk properties. These bulk properties are mainly elastic properties. Many a time, optical and electron optic micrographs will not be adequate since they will not provide the information on the elastic properties of the constituents of the microstructure. Scanning acoustic microscope (SAM) will precisely meet this requirement. In 1949 Sokolov [1] put forward the concept of Acoustic Microscopy. Later concept was developed by Lemons and Quate [2] in the year 1974 (Stanford university). Acoustic microscopy (AM) is a recently developed method for characterization of microstructure. AM is used to reveal density, morphological and microelastic property variations in the image domain. Acoustic/ultrasonic imaging is the important tool for materials characterization. AM is analogous to optical reflection or transmission microscopy and it do not require any rigorous sample preparation such as etching, polishing, sectioning etc., as in traditional microscopy.

Using SAM, one can measure the acoustic properties of microscopic features like grain boundaries, second phases such as precipitates and inclusions and correlate them with bulk material properties. SAM can also be used for studying surface and sub-surface imaging of defects, sensitized microstructures, grain clusters, texture and strain fields, recrystallisation, phase change/ transformation, wave velocity (longitudinal and Rayleigh) in miniature specimens and elastic constants in micro specimens. Understanding SAM images needs considerable expertise on the expected acoustic contrast.

There are several techniques for acoustic microscopy, of which the Scanning Acoustic Microscopy (SAM) is unique in its image quality and resolution. By considering the

application of SAM in materials characterization, attempt has been made to explain the basic principle, working and the different applications of SAM.

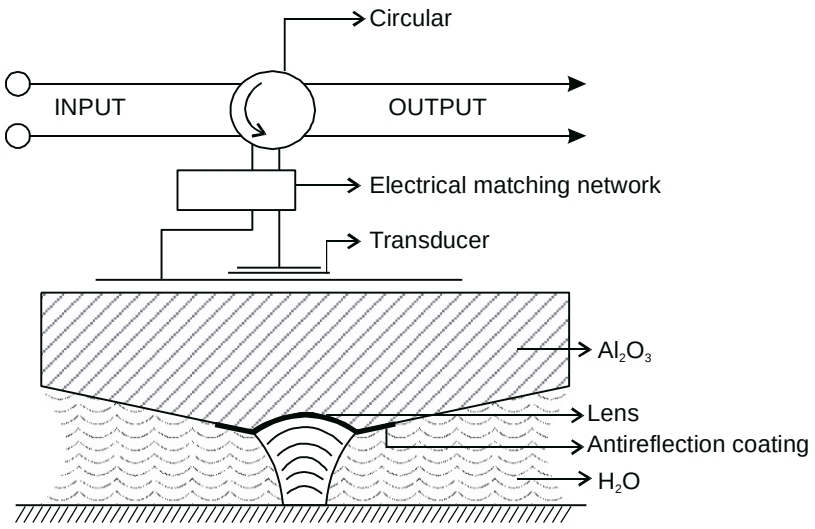



Fig.1 Basic lens geometry for reflection acoustic microscopy

## 2.0 Working Principle of SAM

The heart of the acoustic microscopy is the sapphire lens. At the back surface of the sapphire lens, a piezoelectric transducer is fixed. A short RF pulse is applied to the piezoelectric transducer, resulting in the propagation of acoustic pulse down the sapphire rod. The acoustic pulse is focused into the coupling liquid by the sapphire lens as shown in Fig.1. The focused acoustic pulse gets reflected back from the object, which is to be imaged.

In acoustic microscope, there are two modes of operation. In the first mode of operation namely reflection mode, the imaging object is placed at the focus of the sapphire lens. Therefore, the reflected acoustic waves return along the incident paths. Further, the reflected waves are converted into an electrical pulse by the transducer. The strength (amplitude) of the reflected pulse depends on the object being investigated. Thus, the amplitude is measured and is used to modulate the brightness of the display. In order to get the image of the object, the lens is scanned in raster pattern over the specimen. In the second mode i.e., the transmission mode, acoustic waves are transmitted through the object under study. The strength of the emerging waves on the other side of the object is used to study the object nature. In the reflection mode, the microscope is used to image the subsurface features, while in the second mode it is used to study the interior of thick specimens. The reflection mode is more popular than transmission mode. Due to the advancement in the field of electronics, the instrument has now possessed a high degree of sophistication. The commonly available range of resolution is 500 μm to 20 nm. The operating frequency range of SAM is 50 MHz to 1 GHz.

### 2.1 Acoustical Material Signature: V(z) Curve

In order to characterize these materials one has to measure the Surface Acoustic Wave (SAW) speed in the materials. The SAM is based on the principle of variation of amplitude and phase with the distance between the acoustic microscope lens and the specimen, generally called acoustical material signature or V(z) effect. The SAW is measured from the

V(z) curve i.e., voltage versus defocus distance z, by moving the microscope lens vertically normal to the reflecting surface. The reflected signal voltages are recorded and it lies between a series of maxima and minima as the lens-specimen distance is varied. The observed maxima and minima are due to the phase difference between the central ray and the nonspecularly reflected critical ray that varies with the lens-specimen distance as shown in Fig.2.

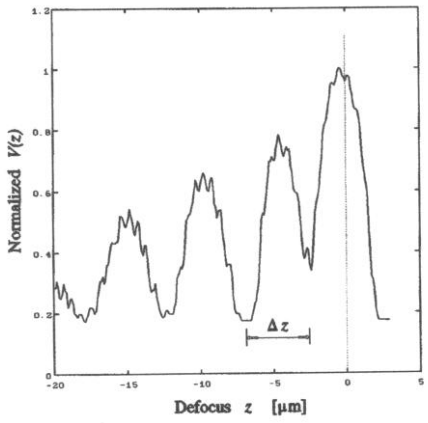


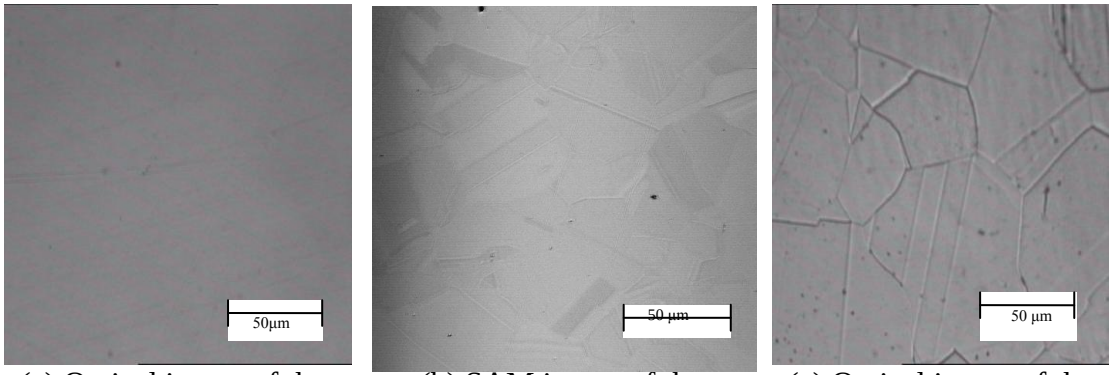

Fig. 2 Variation of voltage versus the defocus distance z

The technological development finds wide application for the NDE community for characterization of both isotropic and anisotropic materials. The development of the line focus acoustic lens finds application to study the anisotropic materials through acoustic microscopy. The materials, which are characterised through acoustic microscopy are AISI type 316 LN and a non-metallic material granite.

## 3.0 Experimental Studies

### 3.1 AISI Type 304 LN

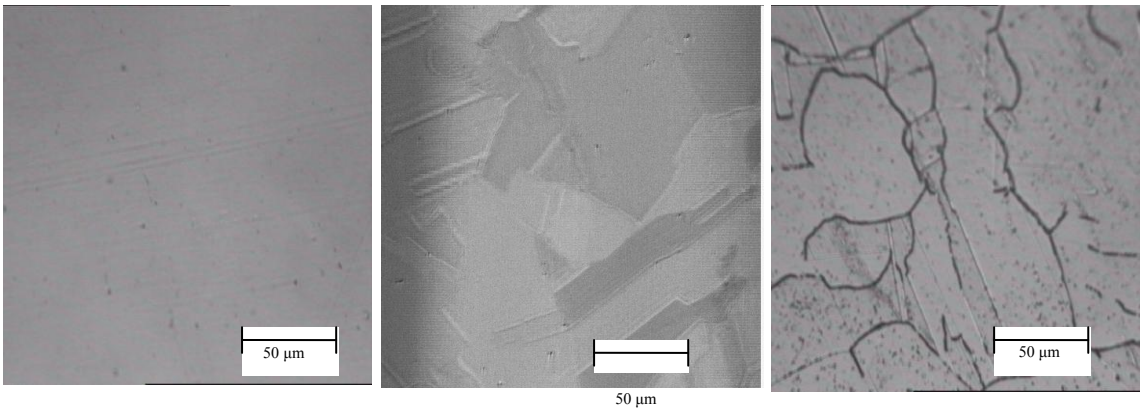
Sensitisation, in the strict sense, means ‘sensitivity, of a material to intergranular corrosion (IGC). The phenomenon of sensitization is of great practical significance because of thermal exposures during welding, fabrication, heat treatment etc. produce the metallurgical condition susceptible to intergranular attack. Austenitic stainless steel, such as AISI type 304 LN is candidate material for fast breeder reactor applications. This steel is used as fuel pin material under the 20% cold worked condition. However, the material gets sensitized when it is slowly cooled through the temperature range 450 – 850 °C or isothermally treated in the above range [3-5]. Sensitization brings down the mechanical, creep and corrosion properties of the components made out of this steel. Hence systematic studies mainly using metallographic techniques are usually followed for monitoring sensitization. However, metallographic techniques are time consuming and destructive. Moreover, metallographic techniques do not provide depth information. Hence SAM studies have been undertaken for the evaluation sensitized properties of AISI type 304 LN.




(a) Optical image of the polished sample (b) SAM image of the polished sample (c) Optical image of the etched sample.

Fig.3. Images of the not sensitized 304LN sample

Figure 3(a) shows the optical image of the polished surface of the not sensitized sample. Figure 3(b) shows the SAM image obtained by raster scanning at 850 MHz mid frequency and figure 3(c) represents the optical image of the etched AISI 304 LN not sensitized sample. Figure 4(a) shows the optical image of the polished sensitized sample. Figure 4(b) shows the SAM image obtained by raster scanning at 850 MHz mid frequency of the sensitized sample. Figure 4(c) represents the optical image of the etched AISI 304 LN sensitized sample about the temperature 700°C for 100 hrs. The SAM images reveal the broadening of the grain boundaries in sensitized sample, which is due to the formation of the chromium carbide precipitation along the grain boundaries.




(a) Optical image of the sensitized sample (b) SAM image of the sensitized sample (c) Optical image of the etched sensitized sample.

Fig.4. Images of the sensitized 304 LN sample.

Sensitization brings down the mechanical, creep and corrosion properties of the components made out of this steel. Hence systematic studies mainly using metallographic techniques are usually followed for monitoring sensitization. However, metallographic techniques are time consuming and destructive. Moreover, metallographic techniques do not provide depth information. Hence SAM studies have been undertaken for the evaluation sensitized properties of AISI type 304 LN.

Figure (5) show the sub-surface SAM images obtained for the same mid band frequency 850 MHz but having the defocusing at Z = 10.3μm. The grain boundaries are distinctly different due to the effect of sensitization. In the sensitized microstructure broadening of the grain boundaries take place due to the effect of stress relaxation by the depletion of chromium to the gain boundaries and the formation of chromium carbides at the boundaries. The strain created at the grain boundaries are seen as fringes.

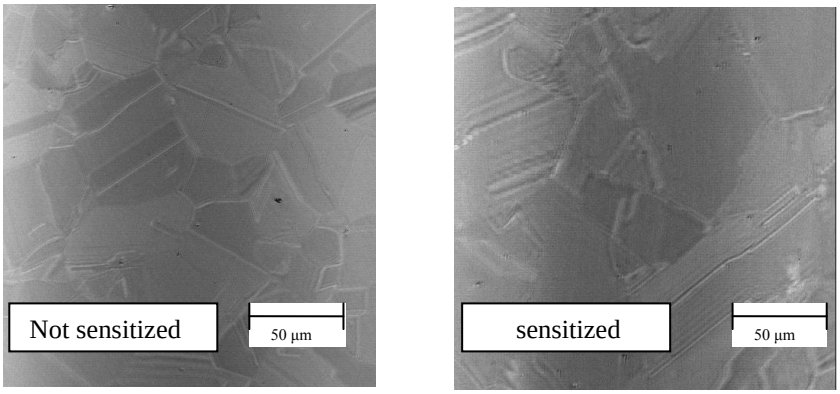



Fig.5. SAM Image defocused at Z= 10.3μm of the not sensitized and sensitized AISI 304LN

### 3.2 SAM Studies on Hampi Stone

The Vithala temple complex with its 56 musical pillars is indeed a splendid monument at Hampi in Karnataka. The roof is supported by huge pillars made of granite, about 15 feet height, each consisting of central pillar surrounded by detached shafts, all cut from one single block of stone. A sample of the granite stone from the broken musical pillar is taken for study of microstructure using scanning acoustic microscope. Granite is one of the hardest types of igneous rock. Granite is sometimes called "monumental stone," as many monuments are made from it. Because of the hard composition of granite, it is one of the most difficult stones to carve.

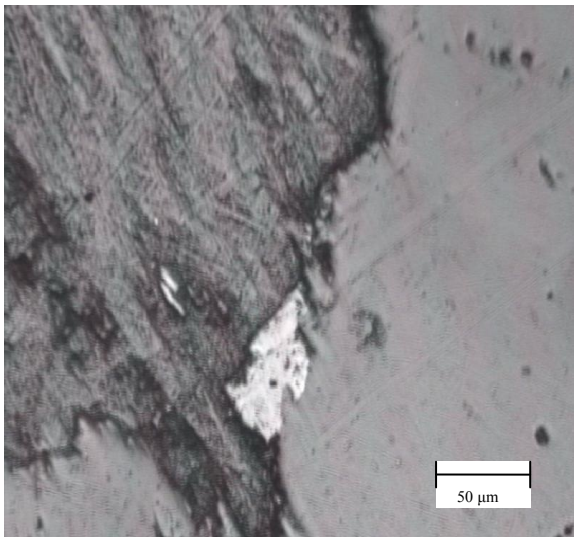



Fig.6. Optical image of Hampi stone

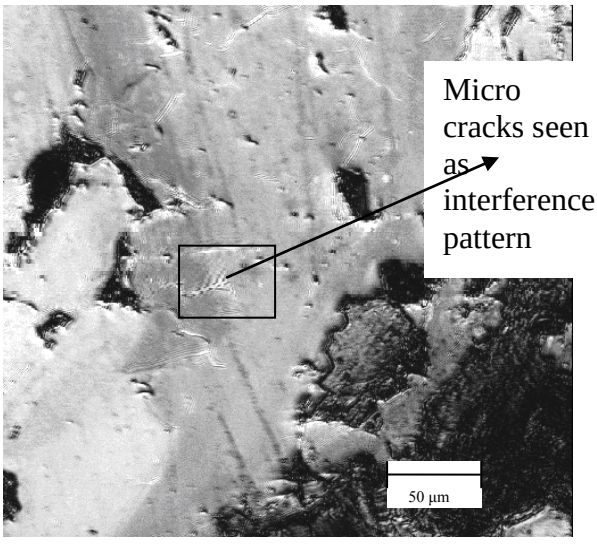



Fig.7. SAM image at surface (Z=0)

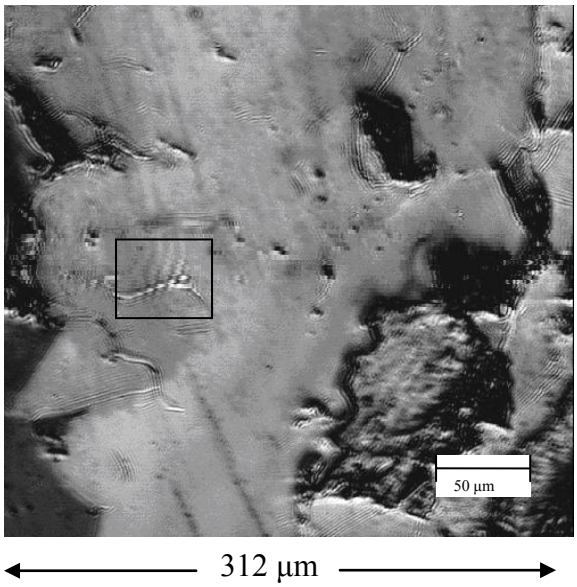



Fig.8. Image defocused at Z= 4µm

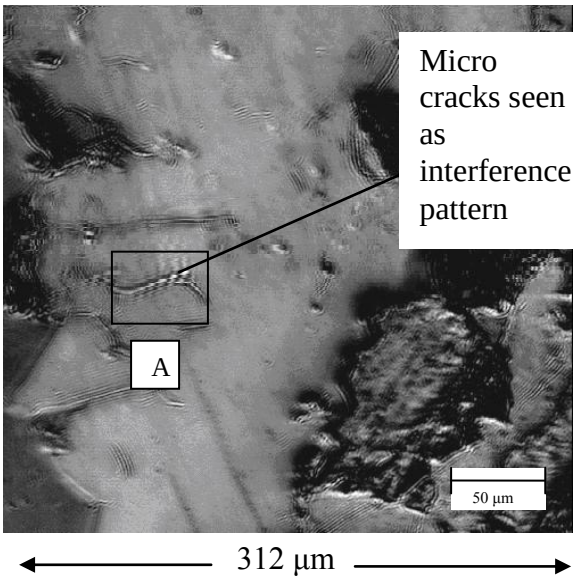



Fig.9. Image defocussed at Z=8µm

Figure 6 shows the optical image of the Hampi stone sample. Figure 7 shows the acoustic image at 850 MHz acquired using SAM. As high frequency ultrasonics have high sensitivity to surface cracks as compared to other techniques like dye penetration test, replica technique and optical microscopy. The micro cracks on the surface are enclosed in a rectangular box. The reflected ultrasonic waves interfere with the incident wave resulting in interference pattern around the crack region.

These interference patterns are more prominent at the subsurface, defocused at 4 µm (Fig.8) and 8 µm (Fig.9). These microcracks are not present in the optical image and detected using SAM proves to be a versatile technique for flaw detection at or near surface. The V(z) response of the granite stone is shown in the Fig. 10 at the frequency 851 MHz. The V(z) measurement is done at the region (A), as shown in Fig.9. From the V(z) curve the velocity of leaky surface acoustic wave is 3679m/s. The V(z) curve has a characteristic response that is dependent on the elastic properties of the reflecting surface.

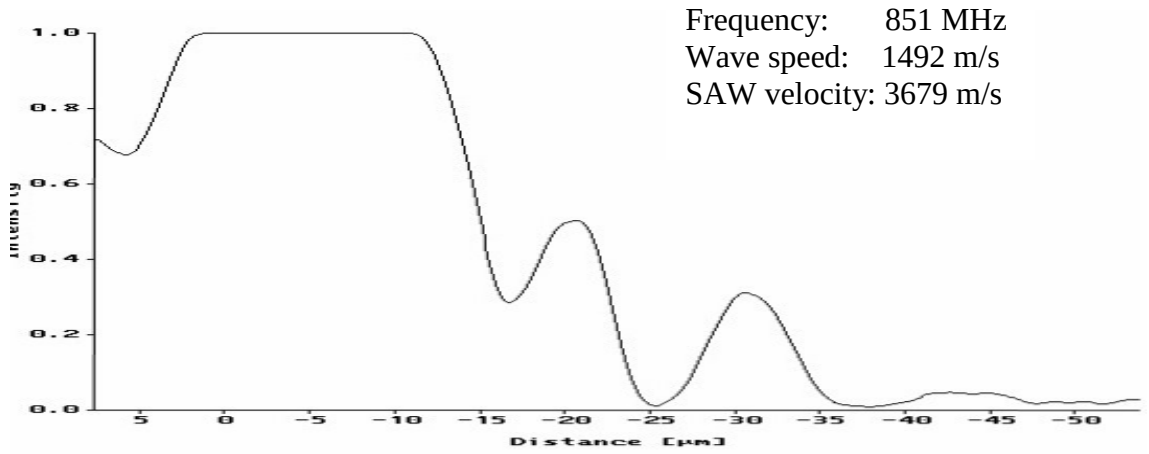



Fig.10. Typical experimental V(z)curve obtained Hampi granite stone

**4.0 Conclusion**

Scanning Acoustic Microscope is a non-destructive analytic tool using ultrasonic waves. In the acoustic signature mode (quantitative mode), the elastic parameters is evaluated. In the imaging mode (qualitative mode), the grain structure is revealed due to variation in the acoustic impedance across the matrix without etching. The contrast in the image is from the variation in elastic constant contributing from the different phases in the matrix. Assess to the subsurface defects, such as crack, inclusions, voids etc is possible, which makes it a versatile technique in non-destructive testing. In case of sensitized AISI type 304 LN, grain boundaries are more distinctly revealed by SAM images both at surface and sub-surfaces. In case of Hampi granite specimens, micro cracks which cannot be optically detected are revealed as interference fringes through SAM images.

**Acknowledgements**

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# Effect of Bio-inoculants on Growth and Quality Seedling Production of Coriander (Coriandrum sativum L.) in Nursery Condition

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## Abstract

Nursery experiments were conducted to select the suitable bio-inoculants and their combinations to improve the growth and biomass of Coriandrum sativum L. Coriander seeds were germinated and transplanted in earthen pot with a potting mixture of unsterilized substrate (Sand : Red soil : Farm Yard Manure)in the ratio of 2:1:1 and bio inoculants were inoculated individually and in combinations with Azospirillum, Phosphobacterium and Arbuscular Mycorrhizal fungi. Control plants also maintained for comparing growth performance. Root length, shoot length and biomass were recorded at 45 days after inoculation. Concentration of chlorophyll and protein in plant tissue were also estimated. Results showed that the bio-inoculants treated seedlings were increased the growth and biomass of coriander. Among all the treatments Azospirillum was found to be the most effective bioinoculant in increasing the growth, biomass and quality of coriander. It was recorded

## INTRODUCTION

Organic farming is getting more popular these days, which accentuates shift from high volume production system to high value production system. For achieving this, management practices that conserve soil health, efficient nutrient supply systems that rely on organics instead of chemicals and integrated pest management play vital role. Among these, efficient, cheap and reliable nutrient supply system will ensure sustainability of the organic farming system. Bio fertilizers in combination with organic manures found as effective component in organic farming for reliable and cheap supply of nutrients. These combinations were ecologically safe and improve soil fertility by improving the soil physical, chemical, and biological condition. At present the pinch on fertilizer consumption is being felt more in India, since the country cannot afford to either import the required fertilizer at high cost and subsidize the sale to the farmers or build new fertilizer plants at formidable cost. Hence farmers are prepared to take to organic farming by using bio-inoculants.

Bio-inoculants are cost effective and eco-friendly natural inputs providing alternate source of plant nutrients, thus increasing farm income by providing extra yields and reducing input cost also. Bio-inoculants increase crop yield by 20-30%, replace chemical N & P by 25%, stimulate plant growth, activate soil biologically, restore natural fertility and provide protection against drought and some soil borne diseases. Bio-inoculants widely used in agriculture crops and Azospirillum is an important non-symbiotic associative, nitrogen fixing rhizosphere bacteria and fixes atmospheric nitrogen in soil [Krishnamoorthy, 2002]. It augments nitrogen fixation [Vijayakumari and Janardhanan, 2003]. Rice responds well to Azospirillum inoculation [Karthikeyan et al., 2003]. However, some evidence shows that this activity has been overlooked. Azospirillum lipoferum produced catechol-typesiderophores under iron-starved conditions that exhibited antimicrobial activity against various bacterial and fungal isolates [Shah et al.,1992]. These inoculants need more attention in view of their triple action of nitrogen fixation, bio-control and production of plant growth regulators. Phosphobacterium also produces auxin and gibberellin, which may have favorable effects on plant growth [Somani et al., 1990]. The stimulative effect of Phosphobacteria inoculation on plant growth in phosphorus deficient soil has been reported by Asea et al. [1988]. However, in many crops still it is at an experimental stage only.

Coriander generally known as "Dhania" (Coriandrum sativum L.) belongs to Apiaceae. It is cultivated in Rajasthan, Gujarat, Madhya Pradesh, Tamil Nadu, U.P., etc. and mainly used as a condiment for its medicinal properties as well as for culinary purposes as spice. Due to the multiple utility, there is a need to improve the sustainable growth and biomass of Coriander. Hence, the present study was undertaken to study the augmentation effect of different bio-inoculants on the growth, biomass and biochemical changes of Coriandrum sativum.

## MATERIALS AND METHOD

### Seeds

Coriander fruits were collected from Horticulture department, Agricultural College and Research Institute Madurai. Seeds were separated and graded and uniform size was used for raising seedlings. Seedlings were raised in a mixture of unsterilized sand: Red soil: Farm Yard Manure (2: 1: 1) in earthen pot in order to find out the suitable bio-inoculants and their combinations to achieve maximum overall growth and minimise the cost of seedling production of the following treatments were given seven days after germination.

**Azospirillum and Phosphobacterium**

Lignite based carrier culture of Azospirillum (Azospirillum brasilense) and Phosphobacterium (Bacillus megaterium var. phosphoticum) with a population load of 109 and 108 colony forming units / gram of peat soil respectively were obtained from the Agricultural College and Research Institute, Madurai, Tamil Nadu, India.

**AM fungi**

AM fungus (Glomus fasciculatum) was isolated and recorded as dominant species in the rhizosphere soil of Coriander. It was multiplied in pot culture in the sterilized mixture of sand : soil (1: 1 v/v) and maintained in the roots of Sorghum vulgare as the host plant. The inoculum contained extrametrical hyphae, chlamydospores and infected root segments were added in the root zones of each seedling.

**Experimental design and Treatments**

The experiment was conducted at the Department of Botany, Thiagarajar College, Madurai, Tamil Nadu, India. The experiment was set up in a completely randomized block design with 8 treatments and twenty four replicates.

Seedlings were raised in earthen pot with a potting mixture of unsterilized sand: red soil: farm yard manure (2: 1: 1). Seven days after germination, 10 grams of peat soil based culture of Azospirillum, Phosphobacterium and vermiculate based AM fungus were inoculated. All the plants were kept under identical nursery condition up to 45 days.

T1- Azospirillum (Azospirillum brasilense)

T2-Phosphobacterium (Bacillus megaterium var. phosphoticum)

T3- Arbuscular Mycorrhizal Fungi (AMF) (Glomus fasciculatum)

T4- Azospirillum + Phosphobacterium

T5- Azospirillum + AMF

T6- Phosphobacterium + AMF

T7- Azospirillum+ Phosphobacterium+ AMF

T8- Control (Sand : Red soil : Farm Yard Manure 2:1:1)

Seedling survival percentage was calculated using the following formula:

$$\text{Seedling survival percentage} = \frac{\text{Number of seedlings present in each treatment}}{\text{Total number of seedlings transplanted in each treatment}} \times 100$$

**Harvesting and measurement**

45 days after inoculation from each treatment, a total of 12 seedlings were randomly selected. Seedlings were carefully uprooted without disturbing the root system and washed in running tap water. Excess of water was wiped out by placing them between folds of blotting paper. Shoot length, root length and basal diameter were recorded. The seedlings were cut at collar region, dried separately at 70o C in paper bags in hot air oven and biomass estimation (root and shoot dry weight) was carried out using top pan electronic balance.

**Assessment of Mycorrhizal infection**

Mycorrhizal root infection was assessed following the procedure of Phillips and Hayman (1970). The root segments were placed in a 2.5 % aqueous solution of KOH (w/v) and boiled in a water bath at 90 o C for 15 minutes. The roots were rinsed in water and lightened in H2O2 (3 ml of 20 % NH4OH in 30 ml H2O2) for 10-45 minutes. They were again thoroughly rinsed with water several times and acidified by soaking in 40 - 50 ml of 1 % HCl for 3 min. Acidified roots were stained in an acidic glycerol solution (500 ml glycerol, 450 ml H2O, 50 ml 1 % HCl) containing 0.05% trypan blue. The trypan blue solution was poured off and the roots were de-stained in acidic glycerol at room temperature. The stained roots were mounted in a glass slide and percentage of infection was calculated.

**Seedlings Quality Index**

Seedlings Quality Index was calculated using the formula of Dickson et al. 1960

Total dry weight (g/ plant) =

Seedlings Quality Index (SQI) / Height (cm) + Shoot dry weight (g/plant) / Root collar diameter (mm) x Root dry weight (g/plant)

**Estimation of Chlorophyll and Protein**

Chlorophyll-a, chlorophyll-b and total chlorophyll content was estimated by the method of Yoshida et al. 1971 and total protein by Lowry et al. 1951.

**Statistical analysis**

The data were statistically analyzed by analysis of variance (ANOVA) and treatment means were separated using Duncan's Multiple Range Test ($P< 0.05$) [Duncan,1955].

**RESULTS**

**Seedling survival:**

The highest (78% ) germination and survival was recorded in C. sativum seedlings treated with Azospirillum (Table1), followed by Azospirillum+ Phosphobacterium (T4) treated seedlings and it was recorded 75% which was statistically on a par with seedlings treated with Azospirillum+ Phosphobacterium+ AMF (T7).

**Shoot length, Root length and Basal diameter:**

Significant differences in shoot length, root length and basal diameter were recorded in C. sativum seedlings inoculated with the different microbial inoculants compared to the uninoculated control (Table 1).

**Shoot length:**

From the analysis of growth data the individual inoculation of Azospirillum (T1) treated seedlings was found to be the most effective in increasing the growth. Among all the treatments, the individual inoculation with Azospirillum (T1) treated seedlings recorded maximum shoot length and it was recorded as 57.71% increase over the control. It was followed by combined inoculation of Azospirillum + Phosphobacterium (T4) with 45.00 % increase over control, 45 days after inoculation (Table 1).

**Root length:**

Significant differences in root length were recorded in C. sativum seedlings inoculated with different bio- inoculants compared to uninoculated control (Table1). Statistical analysis of growth data showed that the individual inoculation of Azospirillum (T1) was found to be the most effective in increasing the root length of seedlings.

Among all the treatments, the individual inoculation with Azospirillum (T1) showed maximum root length 15.82 cm (41.76% increase over the control). The combined inoculation of Azospirillum + Phosphobacterium+ AMF (T7) showed higher root length and was statistically on a par with Azospirillum + Phosphobacterium (T4) inoculated seedlings.

**Shoot Biomass :**

The data pertaining to dry matter accumulation of shoot, root and total biomass are presented in Table 2. Significant differences were observed among the treatments evaluated 45 days after inoculation. The highest biomass in the shoot was recorded in seedlings inoculated with Azospirillum (T1). It was statistically on a par with seedlings treated with Azospirillum + Phosphobacterium +AMF (T7). They registered 47% and 44% increase over control. (Table 2)

**Root biomass :**

Statistically highly significant difference was found in different type of microbial inoculation on root biomass of C. sativum seedlings. Inoculation of Azospirillum (T1) alone and in combination with other inoculants was found to significantly increase root biomass when compared to other treatments. Root biomass was highest in Azospirillum (T1) followed by Azospirillum + Phosphobacterium + AMF (T7) (Table 2).

**Total biomass of seedling:**

Seedling biomass was the highest in the Azospirillum (T1) treated seedlings and it was 48 % more than that of the control and it was statistically on a par with seedlings treated with Azospirillum + Phosphobacterium + AM (T7). In the dual inoculation seedlings inoculated in combination with Azospirillum recorded more biomass than the control (Table 2).

**Seedling Quality Index:**

Good quality seedlings were obtained from seedlings inoculated with Azospirillum (T1). Azospirillum + Phosphobacterium + AMF (T7) showed the next highest seedling quality index, followed by Azospirillum + Phosphobacterium+ (T5). Among the double inoculations Azospirillum + AMF (T5) showed the highest seedling quality index (Figure 1, Table 2).

**Mycorrhizal infection:**

Mycorrhizal infection was found only in seedlings inoculated with AM fungi and the combined inoculation of Azospirillum + Phosphobacterium+ AMF (T7) showed higher levels of infection followed by AMF (T3) inoculated seedlings ( Table 2).

**Total Chlorophyll content:**

Total chlorophyll content was found to be maximum in the seedlings inoculated with Azospirillum (4.650 mg/g fresh weight of leaves) followed by Azospirillum + Phosphobacterium + AMF (3.49 mg/g fresh weight of leaves) (Table 3).

**Protein content:**

Among all the treatments, protein content in tissue of C. sativum seedlings was found to be maximum in the seedlings produced from single application of Azospirillum (0.048 mg/plant) and triple application of Azospirillum +Phosphobacterium + AMF (0.075mg/plant) followed by Phosphobacterium+ AMF (0.066mg/plant) treatment ( Table 3).

**DISCUSSION**

Biologically active products, more appropriately called microbial inoculations, containing active strains of a selective microorganisms like Azospirillum, Phosphobacterium, Arbuscular mycorrhizae alone or in combination, help plant growth through different mechanisms, including biological nitrogen fixation and solubilization of insoluble phosphate fertilizer. In the present study, the height, diameter and dry matter and quality seedlings were higher in the C. sativum seedlings inoculated with bioinoculants. The increase of growth may be attributed to high accumulation of chlorophyll and protein in the plant tissue.

Nitrogen fixing bacteria of the genus Azospirillum have promoted plant growth of agronomically important field crops by 10 to 30% in the field experiment [Okon, 1985; Sumner,1990] crop yield increase in germination rate, plant height, leaf size [Saikia et al., 2001] enhanced minerals and water uptake, increased dry matter accumulation, root surface area, root diameter density and root hair [Okon and Kapulnik 1986]to support the earlier reports. In the present study, Azospirillum inoculated seedlings showed better growth and root biomass when compared to the control. Growth may be attributed due to increased root biomass [Wong and Sternberg,1979], and the production of gibberellins and cytokinin like substances [Tien et al.,1979] which promote the growth of the seedlings. The above results

corroborate with earlier studies on quality seedling production of Casuarina equisetifolia [Rajendran.et al.,2003]; Moringa oleifera [Kasthuri Rengamani et al.,2006]; Acacia nilotica [Rajendran and Jayashree,2007] Delonix regia [Alagesaboopathi and Rajendran, 2009], Samanea saman[Mohan and Rajendran 2012].

Growth promoting effect of inoculation with Azospirillum and Phosphobacterium alone or dual inoculation with both non symbiotic biofertilizers was found in several tree species such as Casuarina [Rajendran.et al., 2003]; Casuarina trees treated in farm forestry [Rajendran and Devaraj, 2004] Feronia elephantum [Mohan and Rajendran 2014]. Similarly, In the present study Phosphobacterium inoculated seedlings produced better plant height, stem girth and total biomass. It may be due to inoculation of phosphate solubilizing microorganism Bacillus megaterium which has shown stable and consistent capacity to solubilize insoluble phosphorus and thus making it available to plants.

Phosphate plays a major role in the root development [Kuccy, 1987]. Stribley [1987] reported that P seems to be the most important nutrient involved, other nutrients such as N, P, K, Ca, and Mg are translocated along with AM hyphae. Inoculation with AM fungi is known to enhance plant growth by improving the mineral nutrient of the host plant [Abbott and Robson, 1982; Mohan and Rajendran 2012]. In the present study mycorrhizal infection in roots of seedlings were found only in the inoculated seedlings. It is also recorded that growth medium needs bioinoculants and AMF inoculated seedlings had improved growth and nutrient content especially P uptake in the present result corroborate with earlier reports by Verma and Jamaluddin, 1995.

In the present study dual inoculation of AMF with Phosphobacterium influence the growth and biomass of Coriander seedlings. It is relevant to mention here that Phosphobacterium by virtue of its capacity to multiply certain growth promoting substances like IAA and GA might induce the growth of C. sativum seedlings [Ramamoorthy, 1982; Gaur,1990]. Among all the treatments are combined inoculations of Azospirillum + Phosphobacterium +AMF produced excellent growth, biomass and tissue nutrient concentration. The greater height, diameter and dry matter of the C. sativum seedlings due to co-inoculation of all the biofertilizers might strongly improve accumulation of nitrogen due to Azospirillum [Gunjal and Patil 1992; Mohan and Rajendran 2014]], more phosphorus uptake by Phosphobacterium [Kuccy ,1987] and VAM fungi [Young et al.,1988].

The total chlorophyll and soluble protein content was found to be maximum in the seedlings inoculated with Azospirillum. This increase is in agreement with other findings [MCArther and Kawlis, 1993] and was attributed [Singh et al.,1983] to the greater supply of nitrogen to growing tissues. Similarly increase in chlorophyll and soluble protein content was also recorded in shola species [Sekar et al., 1995] with inoculation of Azospirillum+ Phosphobacterium.

## CONCLUSION

Increasing dry land farming and development technologies for arid lands with soil related constraints now acquire new importance and emerge as new frontiers for agricultural development. Increased agronomical production has to come through the adoption of better management technology. Long-term sustainability in agriculture is possible only through the use of low cost farm grown inputs, which work in harmony with nature. Bio-inoculants act as perpetually renewable inputs helping in better tree crop nutrient management and maintenance of soil health, better soil and water management leading to improved agricultural practices. It is inferred that under appropriate technology, the use of efficient microbial inoculants yield increased growth and biomass of Coriander seedlings. The present study clearly shows that the application of Azospirillum plays a significant role in increasing the growth response of C. sativum seedlings in a stipulated period, thereby producing good quality seedlings. These treated seedlings may perform better in nutrient impoverished soil too.

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# Indigenous Knowledge System Adoption in the Sustainable Cropping, Food Grains and Fishing Management

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**Abstract:**

Indigenous knowledge system is peoples' knowledge through all time experiences and these practices are generally adapted and passed over generation after generation among the different communities. This knowledge system has been significantly applied in farming, cropping systems, storage and processing of food, live-stock management, traditional healing practices, soil and water management, human health and in many other practices. The important knowledge system has often being in a state of hidden nature and further its loss of disappearance leads to proliferation of the problem, questioning the continuation of those sustainable practices. Documentation of indigenous knowledge system is importantly considered. The present study was done with the objective of documenting the indigenous knowledge systems developed and has been practiced by local and indigenous communities on the management of farming, food grains preservation, community fishing and to ascertain the livelihood utilization of bio-resources. The treasure trove of indigenous knowledge system has to be preserved and more scopes for documentation for the provision of additional knowledge to the context of natural resources conservation, essentially important to reach the goal of food grains management through sustainable utilization.

## Introduction

Indigenous knowledge system is the systematic method adapted by communities and it is a kind of peoples' knowledge through all time experiences, their own field trials with a through understanding of the environment. This traditional knowledge system of local community reflects the requirements, experiences of their age-old traditions (Haverkort *et al.,* 1991, Sukumaran *et al.,* 2008). These practices are generally adapted and passed over generation after generation by local indigenous people, tribal population, rural artisans, cattle rangers,

traditional healers, women folks, villagers, traditional farm practioners etc. Traditional ecological knowledge is importantly considered by worldwide communities and also by international institutions. (Mathur, 2007).

Indigenous knowledge of Post-harvesting techniques, seed and grain storage methods, pest and disease management, weed management procedures have been documented (Oladele *et al.,* 2008). Agriculture production is the prime important source of activity in the livelihood development. Multifaceted problems are associated with this activity, viz., natural calamities, resources depletion, water quality; soil fertility, pests and disease are among the major constraints making difficulties upon the livelihood. These constraints eventually have been posing threats to food insecurity and ecological health imbalance. Indigenous knowledge system has the proven value to meet the challenges of the current problems.

The hidden nature of indigenous knowledge, loss or its disappearance is occurring which has further repercussions on the problem once lost; orally based knowledge can not be retrieved. Scientific communities and local communities need to integrate to have a common ground, enabling communication. Documentation of indigenous knowledge system adapted by the local communities is first and foremost important which will help in acquiring the local peoples' knowledge for further use, to adapt the technique by the spatially located people and community, the scientific principle behind such knowledge system and also to improve such knowledge through drawing up and implementing the refined knowledge and skills (Kannan and Annadurai, 2011).

The present work was undertaken with the objective of documenting the indigenous knowledge systems developed and practiced by the local and indigenious communities and their hidden wisdom regarding conservation, adaptation and management of indigenous crop and live-stock management and to ascertain the livelihood utilization of such bio-resources.

## Materials and Methods

### *Description of the Study Area*

Documentation of indigenous knowledge system was carried out through survey which was carried out in 16 villages located in 6 districts viz., Madurai, Theni, Dindigul, Sivagangai,

Ramanathapuram, Nagapattinam of Tamil Nadu, India. The study site details are described below:

Sustainable farming and grains storage and processing through indigenous knowledge system were observed in Karanthamalai Hill Range is located in Natham Taluk of Dindigul district. This mountain range is a part of Sirumalai hills range of south eastern western Ghats. Chinnamalaiyur village, which is located on the Karanthamalai Hills was selected as one of the present study areas. The area of investigation lies between 10º 12' and 10º 25' N Latitude 78º0' and 78º20'E longitude with the elevation of 1688ft MSL, measured at the highest peak. Temperature ranges between $17^0$C (minimum) and $35^0$C (maximum). The forest type is dry deciduous with few number of evergreen trees. Moopan tribe settled since 100 years. Farming and cattle rearing are the major livelihood activities of the community.

Documentation on paddy seed storage and processing for germination using paddy straw basket was observed in Sattyakudi village of Keezhaveloor Taluk of Tanjavur District. Red gram seed balls for the protection and seed treatment was observed in Sadiya Goundan Patty of Sedapatti Block, Madurai District. Community fishing was recorded from Kallanthiri, Appanthirupathi Panchyat, Madurai District.

***Methodology***

The present study was conducted from September 2009 to March 2010 and the information about the currently used system of indigenous knowledge were obtained from farmers of the above-mentioned experimental sites through direct interviews. Information regarding vernacular name, plant parts used and process for the specific activity was collected from the communities viz., *Moopan, Irular* and farming communities. The interview schedule was the major tool used to explore the farmers' wisdom and their perception regarding the indigenous resources use and improved products formation. Information was also collected through participatory field research methods through semi-structured interviews, field inspections and field observations. Plant specimens used in pest management practices were collected and identified with the help of regional and local flora (Gamble and Fisher 1957), while collecting ethnobotanical aspects, standard approaches and methodologies have been followed

(Jain, 1989). Information was mainly gathered from for village chiefs, local old women and farmers.

## Results and Discussion

### *Paddy seed storage technique*

Cow-dung coated paddy straw basket was prepared and it was used to store the paddy seeds by Sattiyakudi farmers. A mound of freshly harvested paddy seeds was prepared using this method. After the paddy harvest was done, some paddy seeds selected for the next cropping season were dried under open sunlight. Then during a midnight time, the freshly cut paddy straw was used to make rope like structure by spinning the straw and again the clean paddy straw was spreaded into this paddy straw coir. Inside this structure, about 55kg (9 '*Marakka'l*; 1 '*Marakkal'* = 4 '*padi*'; about 6 kg) sun dried paddy seeds were kept and tightly closed like a ball, with a hanger like a structure made from the same coir spindle. The outer surface of the mound was covered with freshly prepared cow-dung paste and kept for drying.

After solarization (dried under open sunlight), this ball like paddy seed mounds, (Plate 1) were kept separately in the storing place. This structure facilitated the paddy seeds to maintain a constant temperature and the cow-dung coated over the surface prevents the paddy seeds from the pests and *Callosobruchus chinensis* insect. At the time of sowing the seeds in the motherbed, the entire mound was used to soak under water continuously for 10-12 hours then it was spreaded in the prepared mother bed. This method was found very effective for paddy seed storage.

This practice of using cow-dung coated paddy straw mound was followed until 30 years ago by many of farming communities of the East Tanjore. But now, no such practice has been followed, except a farmer by name Ambigapathi, Sattiyakudi Village of Nagapattinam District, which was based on the combined principles of i) biological and ii) physicochemical procedures. The common practice of solarization, a physiochemical method is commonly adapted by the farmers mainly for seed preservation and seed processing. The most infectitious agents are killed by this practice as it was shown by Lale (1998). Eggs and first instar larvae *Cryptolestes maculatus* and the first instar larvae of *Cryptolestes subinnatatus* were found effectively destroyed by solarization method (Lale and Vidal, 2000).

The present investigation was carried out to the document the method adapted by an indigenous community was based on biological and physiochemical procedures. Those practices not only help to preserve the paddy seeds using biological method for future cropping; but also enhance their germination potential.

***Red gram seed preservation***

In Sadiya Gaudanpatty village of Sedapatty Block, Madurai District, the farmers adapt a unique method of preserving red gram *(Cajanus cajan* (L.) Millsp. seeds as against pest attack.

After thrashed out the red gram seeds from the pods, the seeds were sun-dried and made into seed balls. It was done by coating the dried red gram seeds with the paste of red clay made by mixing red soil with water. The red earth coated seeds were kept for 3 days and sun dried for an hour. The completely dried seed balls (Plate 2) are kept in jute bags for further use as a seeding material for the next season. This method is found proven to prevent *Callosobruchus chinensi*s insect attack.

In this study, native soil and its use by the indigenous people for seed preservation was explored. In the previous works, neem and *Eucalyptus* leaf powder mixed with mustard oil paste were found highly effective against stainton insect (Patel and Patel 2002).

***Indigenous seed storage methods***

The harvested paddy seeds are stored in a compact, closed room with a small door opening at the front side called *'Chenthi*' has been used by some of the farming community of Poolangulam village, Andarkottaram Panchayat, Madurai District. After harvesting and thrashing out paddy, the seeds were sun dried and stored in the *chenthi* with a dimension of 11 x 8 x 4 ft. About 50 bags of paddy seeds could be stored in that structure. Window of this *Chenth*i is closed during rain, otherwise this is opened at all times.

Neem (*Azadirachta indicia.* A. Juss.), Pongam (*Pongamia glabra* Vent. Jard.), Nochi, (*Vitex negundo* L.*)* leaves were spreaded over the paddy grains, kept inside *Chenthi*. The stored grains are drawn, whenever required for making rice for consumption.

***Baked mud granary***

Another grain storage structure locally named as '*Kulumai*' was spotted in Chinna Malayur village of Karnathamalai tribes settled areas (Plate 3). The height of this structure ranges from 1m to 4m. Those mud pots were made up of clay soil and plant fibres and to harden the storage structure, crop debris such as husk was also mixed during making the '*Kulumai'.* The centre portion is broader with a narrow hard bottom and a narrow opening. This is closed with a lid, made of similar material and precisly made to fit to the size of the mouth of the giant pot, which further protects the grains our of the reach of insects and pests, during storage.

The storage techniques developed by the local community are user-friendly. Scientific reasoning of using such indigenous storage structure for the benefit of grains and also the local community was depicted by Kiruba *et al.,* (2008). Like the '*Kulumai*' structure documented from this study, several modified structures for grain storage were documented by Karthikeyan *et al.,* (2009). There is always the need for adequate and efficient storage facilities to save the excess crop that is produced from deterioration and waste. Storage of food resources is a tripod objective in any human society which ensures steady availability of produce and thereby reducing the seasonal fluctuations of market prices and to eliminate or reduce quantitative or qualitative losses, thereby ensuring the availability of healthy and quality seeds for planting. This practice of using indigenous storage structures is economically beneficial, by making them from the locally available materials. Further this practice enables farmers and producers to self-off their value added produces at strategic times for the best market prices.

***Community fishing***

Fishing is done by the village communities in Kallanthiri tank, Madurai district. This event occurs every year in the drying pond. This activity benefits to 18 villages around this pond. The fresh water fishes caught in this pond is given in the table (1).

On the fishing day, they perform *pooja* in '*Ainthumalai Ayyanar Koil*'. After the *pooja* offered to the deities, the community performs fishing. People use all kinds of materials including towels, shawls, dhothies, bamboo fibre baskets, fishing nets for fishing.

Earlier work on indigenous community practice of combined fishing in Tissa River of Arunachal Pradesh was documented (Battacharjya, 2008). Similar informations are also available (Yadava *et al.,* 1981; Townsley 1993; Goswami, 2000). This method supports the view of

communities' cooperation effort in fishing is beneficial; besides this method is found very effective in the deoxygenation of water bodies by continuous mixing through churning of bottom sediments and make the fishes to come out from their hide-outs.

The intellectual knowledge development and practice is a part of traditional lore of the community. It is amazing to note that even in this transitional period, considerable number of traditional methods and practices on food crops preservation are still persisting in some communities. Research and developments are concepts which are not used to those traditional knowledge systems. Conscious measures have to be sought to preserve this tradition to prevent the loss of the valuable asset of the human society.

Documenting traditional knowledge system assists to the present-day living in several ways especially to find strategies to combat the ill-effects of the natural disaster like drought, famine; contributing better to the forestry, wildlife and agriculture management systems. Since the concept of indigenous knowledge is centered on the communities' participation on the environment and biodiversity conservation, this principle contributes and supports to the concept of sustainable life on earth (Mathur, 2007).

Comprehensive and systematic surveys and documentation are required in other unexplored areas and communities to get the valuable information on indigenous food crops management systems before they lost (Kiruba *et al.*, 2008 and Kannan and Annadurai, 2011).

## Conclusion

Traditional knowledge system developed and has been adapted by indigenous community and tribal population for their sustainable livelihood provides enormous benefits even to this modern era. The present study was attempted to undertake the documentation of indigenous knowledge system developed and practiced by some communities of Tamil Nadu on farming and cattle management. Those advantages are not only limited in providing goods, crop, food substances, medicine, cattle feed and other products; but also provide additional income, economic rehabilitation, stabilization of community, restoration of biodiversity and habitats, knowledge, skills, tools for the sustainable environment and development.

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**Table 1**

**Edible fish varieties caught in Kallanthiri Pond through community fishing**

| S.No | Zoological Name | Local Name |
|---|---|---|
| 1. | *Clarion* sp. | Cat fish |
| 2. | *Catla catla* | Catla |
| 3. | *Channa punctatus* | Kuravai |
| 4. | *Cabeo rohita* | Rohu |
| 5. | *Tilapia mossambica* | Chelappi |

**Plate 1: Paddy straw mound prepared and used to store paddy seeds**






**Plate 2: *Cajanus cajan* seeds coated with red soil and dried under sunlight**

**Plate 3: Structure of a '*Kulumai*' used for grains storage by the tribal communities of Chinna Malayur village on Karanthamalai**

# Healing Across Cultures: The Itzamma Project in Sustaining Plants, People and Global Health

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## Introduction

Our environment is rapidly changing. There are a multitude of complex anthropogenic as well as natural factors which influence this phenomenon. We are in need of creatively addressing a multitude of global issues in our health and well being and in the sustainability of both people and planet. We must avail ourselves to learning from applicable lessons in the diverse evolution of humanity. In effect, we must learn from our traditions. The following puts forth a model project envisaged and implemented by a group of traditional Q'eqchi' Maya Healers in the rainforest-laden Maya Mountains of southern Belize, Central America. Their project stands to point out strong utility in learning from traditions in sustaining plants and people.

Since the dawn of humanity, indigenous peoples, the world over, have lived closely with nature. These generations of shared learning in close connection to the natural world have nurtured stewardship worldviews embedded in cosmocentric perceptions of their environment as well as a strong utilitarian grasp of natures resources. This grasp, or folk knowledge, is recorded and propagated from generation to generation mainly via oral traditions. Traditional botanical knowledge and traditional healing knowledge are intertwined in this folk knowledge network and hold strong possibilities in support of global health and wellness to this day (Pesek, Helton & Nair 2006). This knowledge, however, is disappearing along with the loss of cultural and biological diversity.

The loss of cultural diversity can be seen in the loss of languages (Maffi Ed 2001; Buenz 2005; Maffi 2001; Sutherland 2005). There were 15,000 languages spoken 70 years ago, and, of these, there are roughly 6000 still spoken (Sutherland 2003; Maffi 2001; Davis 1999; Grimes 1996). Our cultural diversity is inextricable to and being lost concurrently with

the loss of natural areas and the biodiversity therein. Forests are being destroyed at an atrocious rate and biodiversity trends indicate accelerating loss. The United Nations Food and Agricultural Organization (FAO) demonstrates: loss of 9 million to 12 million hectares (ha, 2.5 acres) of forests annually from 1990 to 2000, roughly 0.8% of forests are being destroyed per year, and total forest losses range from 5 million to more than 20 million ha annually (FAO 2000). Global biodiversity is usefully viewed via the Living Planet Index (LPI) (WWF 2004), a marker for biodiversity that is based on hundreds of vertebrate species in global terrestrial, freshwater and marine ecosystems. The LPI demonstrates that biodiversity is being lost at disturbing rates. During the 30 year timeframe of 1970-2000, the index dropped by 37% (WWF 2004). In fact, due to anthropogenic effectors, global species extinctions are 100-1000 times that of the natural species extinction rate (Hanski 2005).

Jeffrey McNeely, chief scientist for the International Union for the Conservation of Nature (IUCN), argues that indigenous cultures and the forests which they call home are inextricably linked and that to preserve them we must do so concurrently (Arnason, Catling & Small et al 2004). It has been demonstrated that cultural and biological diversity persist to date globally in mountainous areas (Stepp et al 2005). It has also been shown that development in the context of good governance may not necessarily mean the loss of forest resources (Buenz 2005). So, it would seem that a viable course of action in the conservation of culture and biodiversity, in the modern day, would focus concurrent sustainable development and conservation efforts in a culturally appropriate fashion on mountainous areas of high cultural and biological diversity. Traditional botanical knowledge and traditional healing is one potentially strong venue from which to facilitate these efforts.

With the implementation of traditional cultural healing knowledge on global levels, however, complex situations arise which involve varied agendas; cross-cultural differences in communication understanding and expression; intellectual property rights; and benefit sharing possibilities to name a few (Hayden 2003; Berlin & Berlin 2003; Nigh 2002). Unfortunately, it has been the case that even the most well intentioned drug development or bioprospecting projects seldom matriculate benefit to communities in substantive form (Nigh 2002). The body of literature detailing these complexities is vast and there are a number of studies which fairly well detail these complexities and then develop possible suggestions for improvement in these regards (Alexiades 2004; Bannister & Barrett 2004). Perhaps efforts would be more productively spent in alternative venues altogether. It would seem that the drug development or bioprospecting route is not working in optimal form with respect to

community benefit and the tethering of revenues to the forest. More direct methodologies for community benefit and concurrent conservation of culture and biodiversity should be sought.

One very promising alternative which circumvents these issues while providing viable conservation strategies and community support is the development of culturally relative traditional healing and cultural centers and traditional indigenous herbals gardens in conjunction with the promotion of select integration of traditional healing into primary healthcare on a national level (Pesek, Cal & Cal et al 2006; Otarola Rojas, Collins, Cal et al 2010; Pesek, Cal, Knight et al 2012). Since traditional healers underpin the health of the individual in the context of healthful environmental surroundings (Pesek, Helton & Nair 2006) this methodology directly facilitates conservation of biodiversity and culture while effecting community wellness in traditional form.

The authors will now consider the model case of the Itzamma project (Pesek, Cal, Knight et al 2012; and Audet, Walshe Roussel, Cal et al 2012) of the Q'eqchi' Maya of southern Belize where most of their population relies on traditional healers for primary healthcare (Pesek, Cal, Fini et al 2007; Arnason, Cal, Assinewe et al 2004; WHO 2002; Collins, Cal et al 2010; Pesek, Cal, Knight et al 2012; and Audet, Walshe Roussel, Cal et al 2012). The Q'eqchi' are one contemporary Maya cultural group which has inherited knowledge including environment and health perceptions from ancient Maya civilization. Environmental respect and the importance of sustainability and treading lightly is prevalent among the Maya. For example, the Itza Maya, Peten, Guatemala, have a systematic protocol for the integration of agricultural crops with tropical forest stewardship through synergistic species symbioses (Atran 1993). The system facilitates cyclical forest exploitation which enables ongoing forest regeneration as a component of their sustainable use practices (Atran 1993). The Lacandon Maya, Chiapas, Mexico are another group who sustainably farm the rainforest. They cultivate medicinal plants and subsistence staples in house gardens and *milpas* ("cyclical farming plots that involve rotation of productive growth and rejuvenation phases so as to maintain the integrity of the forest"). Their customs include the sustainable gathering of wild plants from the forest (Kashanipour & McGee 2004). In short, their traditional practices support synergistic use and continual regeneration of forest. As a prime example of stewardship worldview, the Yucatec Maya, Yucatan, Mexico, understand the land to be a being which needs feeding, nurturing and other careful interactions (Barrera-Bassols & Toledo 2005). And the Q'eqchi' Maya of southern Belize are proactive in the revival of their healing traditions and conservation of the forest which sustains them for future

generations (Pesek, Cal, Fini et al 2007; Pesek, Cal, Cal et al 2006; Arnason, Cal, Assinewe et al 2004).

**Environmental Backdrop**

Given model conservation practices, the remote and rugged, rainforest-laden Maya Mountains range of southern Belize are host to some of the most intact regions of tropical rainforest in all of Central America (Meerman & Clabaugh Eds 2007). Rainfall is high with roughly 431.8cm annually (Hartshorn 1984). The complexity of the underlying geology of the mountains lends support to unique ecosystems (Pesek, Cal, Cal et al 2006; Bateson & Hall 1977; Dixon 1956). The environmental conditions of the mountains support tremendous biodiversity (Pesek, Cal, Cal et al 2006; Parker et al 1993; Iremonger & Sayre 1994; Ironmonger, Leisnerm & Sayre 1995). Surveys indicate high probability of species new to science being located in the niches of the Maya Mountains (Pesek, Cal, Cal et al 2006; Ironmonger, Leisnerm & Sayre 1995). The area is a biodiversity hotspot and as such demonstrates extreme import in conservation need (Myers et al 2000). However, despite the splendor of the regional biodiversity, the area has a multitude of challenges in economic development. To date, most of the forest cover and forest resources lie within inaccessible protected areas thus forcing dependence on less traditional life ways. This phenomena coupled with the fact that the region is one of the most economically poor areas of Belize leads to a multitude of issues and urgent need for local education and employment. This urgent need must be addressed in the context of economies built on sustainable development and community based conservation.

As reflective of worldwide interests, the Q'eqchi' Maya prefer traditional healing modalities to modern medicine (Arnason, Cal, Assinewe et al 2004; WHO 2002). The World Health Organization notes that more than 80% of the world's population relies on traditional healers for primary healthcare (WHO 2002). Many of the plants relied upon by traditional healers and then global markets are taken from the wild—this threatens extirpation, ecosystem devastation, and biodiversity loss without appropriate implementation of sustainable growing and harvesting programs. Indeed, medicinal plant conservation is an important part of conservation programming in Belize and the rest of the world. The Itzamma project (Pesek, Cal, Fini et al 2007; Pesek, Cal, Knight et al 2012; and Audet, Walshe Roussel, Cal et al 2012), envisaged and initiated by a group of elder Q'eqchi' Maya healers, endeavors to support this conservation of medicinal plants both *in situ* and *ex situ* in

concurrence with the Convention on Biological Diversity. It does so directly through advocating for traditional healing in national healthcare and following through the need for facilitating indigenous local communities in the inventory, conservation, sustainable growth and harvest of medicinal plants.

**The Itzamma Project**

*Itzamma* (a Q'eqchi' Maya word connoting the "home of the Maya god of wisdom, Itzamna, and place of healing spiritually and with herbs") is a name given by the Belize Indigenous Training Institute (BITI) and associated Q'eqchi' Maya Healers Association (QHA) to their model community-based conservation program aimed at the preservation of their rainforests and deep cultural traditions through the promotion of traditional healing in national healthcare (Arnason, Cal, Assinewe et al 2004; Pesek, Cal, Knight et al 2012; and Audet, Walshe Roussel, Cal et al 2012). The Q'eqchi' Maya communities of the area lead as traditional a lifestyle as possible and they maintain intact traditional healing knowledge (Treyvaud-Amiguet et al 2005). They have successfully used nature to treat illness for millennia and as more and more people are using natural healing, Maya healing knowledge must be implemented, by the Maya, which will directly facilitate its conservation.

The indigenously initiated Itzamma project addresses sustainable economic development, biodiversity and forest conservation, cultural integrity and conservation of heritage, community health and wellness and global health and wellness via traditional healing systems and rainforest stewardship practices. The project has been successfully implemented in southern Belize by BITI and the QHA with the support of the Government of Belize and the collaboration of external partners including the Inuit Circumpolar Conference; University of Ottawa, Canada; Universidad Nacional, Costa Rica; Naturaleza Foundation, USA; and Cleveland State University, USA. The team is active with the physical development of the site inclusive of a cultural traditional healing center and indigenous gardens, developing botanical inventories and databases in the Maya Mountains, beginning implementation of traditional sustainable plant propagation techniques, and developing culturally ethical conservation strategies via traditional healing.

The healers developed the indigenous botanical gardens in order to have a renewable source of plant material in close juxtaposition to their center for use in their provision of local primary care. The gardens are used as a place for healing and spiritual ceremonies, in celebration of the Maya calendar (which intersects with traditional healing and lifeways), the

display of traditionally used plants, the *ex situ* conservation of these plants, small scale sustainable agricultural production for local use, and small sustainable enterprise development. Although visits can be arranged to the center and gardens they are not yet open as a major public site, however, this is their future intention.

In a notable study of Q'eqchi' ethnobotany in the area, done prior to the gardens development, Treyvaud Amiguet et al (2005) identified 169 medicinal plant species used by the QHA. Many of them were shown to be rainforest species which were found only in primary forests and not in areas of human influence. In establishing the gardens, the healers and collaborators made multiple collection trips to remote areas of the Maya Mountains (Pesek, Cal and Cal et al 2006) and, over several years, transplanted thousands of sustainably procured plants into ecosystem microniches which they created on site at the gardens. The healers cared for the transplants, including weeding, irrigation, provision of appropriate ratios of leaf-litter et cetera as they consistently evolved their methodologies in developing the gardens as they had envisaged. The vast majority of plants on site are understory species of the primary rainforest. This represented a significant obstacle from the outset given the fact that the land granted to them for the development of Itzamma was secondary forest in early succession. Successfully establishing primary forest species therein and maintaining them healthfully is a challenge that they overcame through varied innovations precipitated by traditional knowledge. Currently, there are greater than 100 species being tended by the healers in their gardens which are then used sustainably by the healers for ceremonial purposes and in the treatment of a large variety of ailments which afflict the local Maya.

Additionally, and of note, the gardens are currently being used in the training of Maya teenagers from the local high school. The elders are teaching the youngsters in traditional healing and lifeways and the production of medicinal plants for small scale commercial microenterprise. The area is further used as a community center and for educational activities with children, and it will eventually be used as a visitor center to bolster the local economy via site specific ecotourism. Plants which are not sacred to the Maya and have local or international commercial value are being grown by their cooperative in adjacent fields.

The medicinal species identified in participatory research with the healers represent a tremendous material for culturally ethical sustainable development. Studies are currently being undertaken to examine these species in order to better understand the scientific basis of the traditional knowledge, improve the quality of phytomedicines, and to make selections for

appropriate sustainable commercial development. *In situ* and *ex situ* conservation of species and biodiversity management is a paramount issue today and the efforts at Itzamma are being linked to the Central American Corridor Conservation Project via Rapid Ethnobotanical Surveys (RES) where the healers and collaborators continue to identify disappearing and endangered medicinal plant sites in the Maya Mountains. This work highlights species and places for conservation (Pesek, Cal & Cal et al 2006).

At Itzamma, traditional healing is being studied as an emerging concept in integrative healing for indigenous and worldwide communities. Indeed, the development of Itzamma is concurrent with and reciprocally supportive of the re-integration of traditional healing into the primary healthcare system of local Maya villages. Following a workshop with policy makers, government officials, local health care providers and the traditional healers including traditional midwives, they all work together now along with village elders to provide primary healthcare in the villages. Difficult medical cases are forwarded to the district hospital (Arnason, Cal & Assinewe et al 2004; Pesek, Cal, Knight et al 2012; and Audet, Walshe Roussel, Cal et al 2012).

Though modest at present, the project holds real promise. It addresses several crucial issues in health while enhancing sustainable management of medicinal plant and local forest resources. It enables local communities' real-time benefits of these resources without depleting the forests and endangering plant species. The project serves as an important model internationally.

**Discussion**

Traditional healing practices are most certainly individualized to culture and even then more so to healers within cultures. It is interesting to note, however, that even in the context of this diversity of cultural healing traditions and traditional healers therein, there are cross-culturally reverberant themes in health and wellness (Pesek, Helton & Nair 2006). Steeped in indigenous empirical observation and a cultural process akin to the scientific method in observation, hypothesis formation, testing, and then interpretation of results for application, these consistent themes have arisen in independently evolving cultural contexts and thus speak to the efficacy of these traditional healing modalities (Pesek, Helton & Nair 2006).

Importantly, one of these recurrent themes is that healthful environmental surroundings are essential to health. Since traditional healers provide a traditional sustainable healthcare and promote for environmental respect, by extension then, that by advocating for traditional healing, there would also be strong advocating for healthful environmental surroundings and stewardship of the natural world.

Select integration of traditional healing in national healthcare supports the conservation of culture and biodiversity while promoting culturally relative health and wellness promotion and the advancing of environmental respect and treading lightly. Traditional healers in primary health care vigorously enhance community health and wellness via direct care and education of their communities. They also enhance overall ecosystem health and could well provide substantive opportunities for culturally ethical economic development in conjunction with the conservation of culture and biodiversity. As one Maya elder wisely puts "science is one eye and traditions are the other—only together will we see our path." Our new way forward is learning from traditions and the Itzamma model serves to demonstrate these strong possibilities in merging science, technology, economic development and other modern trends with traditional lifeways toward a promising tomorrow (Pesek, Cal, Knight et al 2012; and Audet, Walshe Roussel, Cal et al 2012).

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# Fabrication Of Wound Dressings Impregnated With Zinc Oxide Nanoparticles Synthesized From Honey: A Facile Approach For Antibacterial Application

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## Abstract

The present study explores the fabrication of wound dressing materials impregnated with zinc oxide nanoparticles (ZnO NPs) using honey as a reducing and capping agent. Formation of Honey-zinc oxide nanoparticles (H-ZnO NPs) was confirmed by surface plasmon resonance absorption at 360 nm. Morphology and elemental composition of the synthesized H-ZnO NPs were analysed by scanning electron microscopy and energy dispersive X-ray spectroscopy. The wound dressing material was impregnated with H-ZnO NPs by pad-dry cure method. The biocompatibility of the ZnO NPs loaded dressing material was evaluated by hemolysis (1.18%) and whole blood clotting test. The antibacterial activity of the dressing materials was assessed qualitatively and quantitavely by AATCC technique. The ZnO NPs loaded dressing materials possessed a remarkable antibacterial activity compared to honey impregnated and untreated dressing materials. The results illustrate that the biofabricated wound dressing material can be efficiently exploited in therapeutic application.

**Keywords**: zinc oxide nanoparticles, honey, hemocompatibility, wound healing, biofabrication

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## Introduction

Recently, there has been a tremendous surge in unraveling the potential application of metal oxide nanoparticles in biomedical application. Of the different metals, utilization of zinc in nanoparticle synthesis is meager. Nanosized ZnO is an highly preferred multitasking metal oxide due to its unique optical and electrical properties (Wang *et al.*, 2004). Furthermore, zinc oxide is reported to be non-toxic, chemically stable and potentially safe for human use by the U.S. Food

and Drug Administration (Premanathan *et al.,* 2011). The advantages of nanostructured ZnO in biomedical application over other metals are due to its lower cost; UV blocking properties, high catalytic activity, large surface area with greater dispersion (Kumar *et al.,* 2011). Eco-friendly and cost-effective procedures utilizing microorganisms and plants in the synthesis of nanoparticles have been reported extensively all over the world (Sangeetha *et al.,* 2011). Honey-the Food of Gods and one of the natural sweetener for centuries was subjected to extensive studies (Crane, 1975) all over the world related to its ingredients, physicochemical properties and mineral content. However, only a few reports are available on the synthesis of nanoparticles using natural honey. Furthermore, honey is reported to possess antibacterial and wound healing properties (Cooper *et al.,* 2002).

Commercially available wound dressings generally prevent the exposure of infected area to the microbial pathogens; allow free flow of air in order to establish a suitable milieu for natural healing (Paul and Sharma *et al.,* 2004). However lack of antimicrobial activity of wound dressings available in the market is of great concern.

Generally, wound dressings serve as a scaffold in the topological application of antimicrobial creams to the site of infection. Therefore, particular attention is oriented in biofabrication of wound dressings with inbuilt wound healing and antibacterial activity. This can be achieved by the impregnation of wound dressings with ZnO NPs by pad-dry cure method (Aljadi *et al.,* 2000). Utilization of honey as a reductant as well as capping material in the synthesis of zinc oxide nanoparticles will provide a two-fold advantage in wound dressing biofabrication technology. Therefore, in the present study an attempt has been made to biofabricate a wound dressing by the impregnation of the zinc oxide nanoparticle synthesized using honey as a reductant and capping agent. The biosynthesized nanoparticles were characterized by UV-Vis, SEM coupled with EDAX imaging. Therapeutic potential of the biofabricated wound dressing was illustrated by hemocompatibility and antibacterial activity.

## Materials and methods

### Honey sample

Natural, untreated and unpasteurized honey was harvested by squeezing the comb of *Apis indica* collected from the foot hills of Papanasam, Tamil Nadu, India. The sample was filtered and stored under aseptic conditions at 5ºC until further analyses. The honey collected for analyses is of multifloral origin.

### Physico-chemical properties of honey

The sample was analysed for pH, ash, moisture, acidity, sugars and hydroxyl methyl furfural (HMF) following Association of Official Analytical Chemists (AOAC) methods (1990). Electrical conductivity was measured as described by Bogdanov *et al.* (1997). Viscosity of honey was calculated using Ostwald's viscometer following the method of Akoh (1991).

### Synthesis of zinc oxide nanoparticles

Zinc nitrate was mixed with 200 mL of honey to a final concentration of 0.05 mM. After complete dissolution, the mixture was kept under vigorous stirring at 150ºC for 6 h and allowed to cool at room temperature. The pale white precipitate was washed with sterile distilled water (2795xg, 20 minutes) followed by an ethanol wash for purification. The resultant white precipitate (H-ZnO NPs) was dried at 80ºC for 7-8 h. The synthesized ZnO NPs was characterized by UV-visible spectroscopy (Eppendorf Biospectrometer). The morphology and elemental composition of H-ZnO NPs was determined by scanning electron microscopy coupled with energy dispersive X-ray spectrum (HITACHI S-3000H).

### Fabrication of wound dressings

For biofabrication studies, commercially available sterilized wound dressings (Surgicom® BP type 13) were purchased from the local medical shop. Wound dressings were impregnated with ZnO NPs (1% citric acid binder) for 5 minutes and then it was passed through a padding mangle (R.B. Electronic and Engineering, Mumbai), running at a speed of 15 m/min with a pressure of 1 Kgf/cm$^2$ to 100% wet pickup. After padding the samples with H-ZnO NPs dressings were dried at 70ºC for 3 minutes followed by curing at 150ºC for a brief period of 2 minutes. Untreated wound dressing was used as positive control. (El-Rafie *et al.*, 2014)

**Blood compatibility assay**

**A. Hemolysis assay**

The fabricated nano dressing materials were cut into small pieces (approximately 2cm X 2cm) and equilibrated in 4 mL saline for 30 minutes at room temperature. Human blood mixed with acid citrate dextrose (ACD) (0.2 mL) was added to the suspension and incubated for 60 minutes. After incubation, 4 mL of saline was added to stop hemolysis. The solution was centrifuged (27595xg, 20 minutes) and optical density of the supernatant was measured at 545 nm. Positive and negative controls were maintained by adding 0.2 mL of ACD human blood to 4 mL of distilled water and saline respectively. Percent hemolysis was calculated as described by Dey and Ray (2003) as follows:

$$\%\ \text{hemolysis} = \left[\frac{\text{OD of test sample - OD (-) control}}{\text{OD (+) control-OD (-) control}}\right] \text{X } 100$$

**B. Blood clotting index**

Nano dressings were kept in beaker and prewarmed to 37ºC. Twenty five microlitre of fresh ACD human blood was dropped on to the dressing material followed by the addition of calcium chloride 0.02 mL (0.2 mol/l). The dressing material was incubated for 10 minutes at 37ºC with shaking. The red blood cells that were not trapped in the clot was measured at 540 nm at different time intervals. Blood clotting index was calculated as described by Archana *et al.* (2013)

$$\text{BCI} = \frac{\text{Absorbance of blood which had been in contact with sample}}{\text{Absorbance of solution of distilled water and ACD blood}} \text{ X } 100$$

**Antibacterial activity Studies**

Antibacterial property of the nano dressing material (impregnated with 100 ppm of H-ZnO NPs) was tested qualitatively (EN ISO 20645) and quantitatively (AATCC-100). For qualitative analysis, the wound dressings were placed on the agar medium swabbed with bacterial cultures (*Escherichia coli* MTCC 443, *Staphylococcus epidermidis* MTCC 2639, *Pseudomonas aeruginosa* MTCC 424, *Bacillus cereus* MTCC 430 and *Enterobacter aerogenes* MTCC 2822). Zone of inhibition was measured after 24 h of incubation at 37ºC. In quantitative method, the

dressing material was immersed in a nutrient broth (10mL) inoculated with 10µl (7x10CFU/mL) of mid log phase bacterial culture and incubated in a shaker (200 rpm) at 37ºC for 12 h. The samples were serially diluted and transferred to nutrient agar plates. Percent reduction in number of colonies after 24 h of incubation at 37ºC was calculated using the formula,

$$\% \text{ reduction} = \frac{A - B}{A} \times 100$$

A represents the number of bacterial colonies (CFU/mL) in the control and B is the number of bacterial colonies obtained on exposure to nano wound dressing material.

**Results & Discussion**

The physicochemical parameters of honey collected from the bee hives is depicted in Table 1. The sample was found to be acidic (4.5). Acidity of the honey may be due to the fermentation of sugar into organic acid. Acidity is reported to be responsible for honey's flavor and stability against microbial spoilage (CDEU, 2001). Further the pH value was within the permissible limit indicating the freshness of the honey as described by Khalil *et al.* (2012). The moisture content of the honey was found to be 16.6 which might be due to the different floral source. The low moisture content prevents the microbial attack during storage (Moniruzzaman *et al.*, 2013). The moisture content of the honey collected was consistent with the previously reported values (Khalil *et al.*, 2010).

Electrical conductivity (EC) is a key physicochemical parameter for the authentication of honey quality (Mateo *et al.*, 1998). The EC value depends on the ash and acid content of the honey (Bogdanov *et al.*, 2002). This parameter was recently included in the International standards, replacing the determination of ash content (Alimentarius, 2001). In the present studies EC value of honey sample was found to be within the recommended range (0.12 mS/cm). HMF value indicates the purity and freshness of honey. The HMF concentration (5.65) of the honey collected was found to be within the limit set by the Codex Alimentarius Commission and the European Union. The result obtained illustrates that the honey harvested was found to be of good quality in respect to HMF content, reducing sugar concentration, pH, acidity etc.

**Synthesis and characterization of Zinc oxide nanoparticles**

Zinc oxide nanoparticles have attracted great attention because of its superior optical properties and wide application in biomedical sciences. In the present study, ZnO NPs was synthesized using honey as a reducing agent. The addition of honey to 0.05mM solution of zinc nitrate led to the appearance of white precipitate resulting in the formation of H-ZnO NPs. The nanoparticles exhibit a strong UV absorption spectrum with the absorption peak ranging from 350-370 nm due to its surface plasmon resonance and attains a plateau above 3.3eV (360 nm). The absorption peak centered around 350-370 nm wavelength confirms the presence of ZnO NPs (Fig. 1)

**SEM with EDAX analysis**

SEM image illustrates the surface morphology, size and shape of the nanoparticles. Scanning electron microscopic image of H-ZnO NPs along with EDAX was presented in Fig. 2. SEM imaging revealed the crystalline nature of the synthesized nanoparticles with the particle size approximately 52 nm. EDAX spectrum confirms the purity and elemental composition of the nanoparticle with the presence of zinc and oxygen.

**Hemolysis assay**

Hemolysis is considered as a reliable measure of determining the blood compatibility of biomaterials. Generally, smaller the hemolysis ratio value, better the blood compatibility of the biomaterial. In the present study, H-ZnO NPs impregnated dressing material induced 1.8% hemolysis (Fig.3). Whereas hemolysis was found to be 3.2% and 4.7% with negative and positive control. Autian *et al.* (1975) reported that a value of up to 5% hemolysis is permissible for biomaterials. So the dressing material impregnated with H-ZnO NPs was considered highly hemocompatible.

**Whole blood clotting**

In this study, the antithrombogenic activity of the biofabricated dressing material is qualitatively expressed by a relative parameter blood clotting index (BCI). Blood clotting index of the nano dressing material possessed shorter clotting time than honey impregnated and untreated materials. The quicker the absorbency and shorter the clotting time better the hemostatic effect of the material used. In the present study, after 10 minutes of incubation, BCI of H-ZnO NPs loaded wound dressing and honey impregrated wound dressing was found to be 77 and 53 respectively. Untreated wound dressing material possessed a BCI of 22 after 10 minutes of incubation.

## Antibacterial

The antibacterial activity of H-ZnO NPs loaded dressing materials was evaluated qualitatively and quantitatively by standard methods. It is evident from the results (Fig.4) that the gram negative bacteria was found to be highly susceptible to nano dressings than gram positive bacteria (Table 2). The Gram-negative bacteria possess a negatively charged outer membrane and a thin peptidoglycan layer (~7-8 nm), which facilitates the anchoring and penetrating of the ZnO NPs. In contrast, the gram positive bacteria have a thick three dimensional rigid structured peptidoglycan layer (~20–80 nm), which limits the penetration of the positively charged ZnO NPs (Hebeish *et al.,* 2010). In this study, bacterial inhibition was considerably lesser with honey impregnated dressing materials. Furthermore, untreated dressing materials failed to inhibit the growth of bacteria.

## Conclusion

To conclude we have reported green one-step cost effective biofabricated nano dressings impregnated with H-ZnO NPs. This study is the first to report the synthesis of ZnO NPs using honey as a reducing agent. Moreover, combination or synergistic effect of zinc oxide with honey against pathogenic bacteria is a new finding. Thus the biofabricated nano dressing materials can compete with commercial antibiotics used in the treatment of microbial wound infections and are even better. However more research work on animal models needs to be done before commercial application.

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**Table 1 Physicochemical constituents of natural honey**

| **Parameters** | **Units** | **NH** |
|---|---|---|
| pH | | 4.5 |
| Ash content | % | 0.46±0.14 |
| Moisture content | % | 16.60±1.69 |
| Free acidity | Meq/kg | 13.76±0.17 |
| Lactic acidity | Meq/kg | 2.31±0.12 |
| Total acidity | Meq/kg | 27.3±0.32 |
| Color | | Light amber |
| Viscosity | Centipoise | 3.4±0.12 |
| Electrical conductivity | ms/cm | 0.12±0.23 |
| Hydroxy methyl furfural | Mg/kg | 5.65±0.45 |
| Carbohydrate composition | | |
| Total sugar | g/100 g | 72.35±1.43 |
| Reducing sugar | g/100 g | 69.24±0.24 |
| Sucrose | g/100 g | 5.32±1.50 |

Data are given as mean±standard error of three replicates

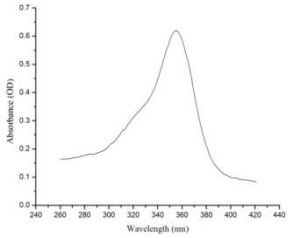
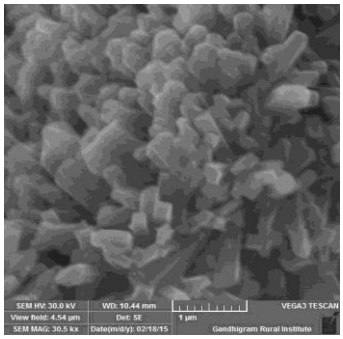



**Fig.1 UV-vis absorption spectrum of H-ZnONPs**



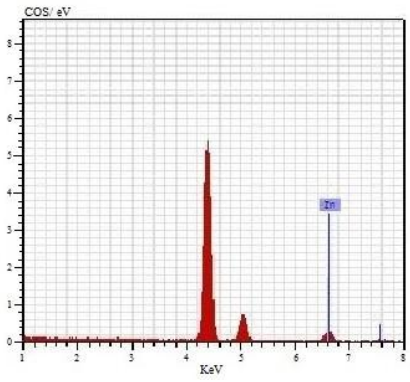



**Fig 2. SEM – EDAX analysis of H-ZnO NPs**

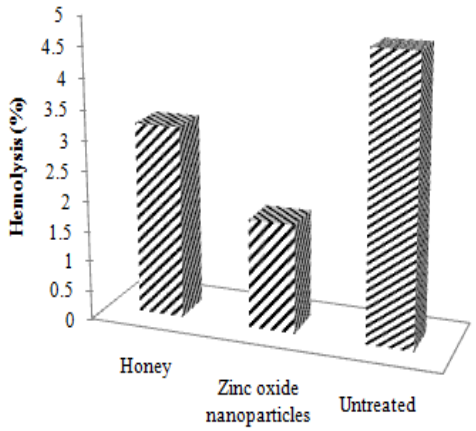



**Fig.3 Hemolytic activity of biofabricated wound dressing materials**

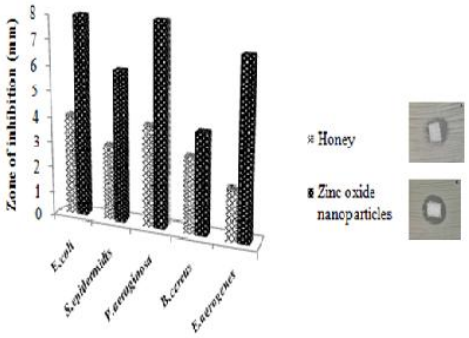



**Fig. 4 Antibacterial activity of biofabricated wound dressing materials against different pathogens**

**Table 2 Quantitative assessment of antibacterial activity of wound dressing materials by percentage reduction method**

| Samples | Percentage reduction | | | | |
|---|---|---|---|---|---|
| | ***E. coli*** | ***S.epidermidis*** | ***P. aeruginosa*** | ***B. cereus*** | ***E. aerogenes*** |
| Honey | 50 | 60 | 52 | 33 | 44 |
| Zinc oxide nanoparticles | 87 | 84 | 81 | 76 | 79 |

# Instruction To Authors

**1.General**

Contribution must be in English or Tamil. They should be accompanied by a written declaration, signed by the authors, that the paper contains original, unpublished material and has not been submitted for consideration elsewhere. Two references will evaluate all contributions before they are accepted for publication.

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**2.1 Research papers**

Full length research papers should not normally exceed 10 double line spaced manuscript pages (including illustration and tables).

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Preliminary reports of novel research findings are acceptable as communications and should not normally exceed 5 double line spaced manuscript pages (including illustration and tables).

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Reviews should be short, critical and highly focused surveys of progress in a specific area of current research interest. It should not aim to be comprehensive , but should contain in its introduction a historical perspective and in the conclusion likely future directions. These should not normally exceed 10 15 double line spaced manuscript pages.

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The title must be brief, Specific and informative.

**3.2 Authors and Affiliations**

The names with initials of authors must be given and should be followed by superscript lowercase letters to indicate different addresses . The name of the corresponding author should be followed by*. For example, A.M.Petrosyana, R.S.Feigclsonb* aYerevan state university, Alex Manoogian st. 1, Yerevan 375049,Armeniab* Centre for materials Research, Standford University , 105,USA

**3.3 Abstract**

The abstract, not exceeding 150-200 words, should be informative and highlight the objectives, outline important observations and reveal major conclusions.

**3.4 keywords**

4 - 6 keywords for indexing and information retrievel.

**3.5 Main Text**

The main text of the paper must be divided into sections starting with an introduction and ending with conclusions. The main section should be numbered 1,2,3 ,etc., the subsections 1.1,1.2,1.3,etc., further sub-sections(if required)

**3.6Acknowledgements**

Acknowledgments should be given for any assistance given to the study.

**3.7References**

References to published work must be cited in the text by authors name followed by the year of publication. Some examples are: Shirsat, M.D., Hussaini, S.S., Dhumane, N.R., and Dongre, V.G., (2008), "Influence of Lithium ions on the NLO properties of KDP single crystals", Cryst. Res. Tech.,

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All tables, figures and photographs must be cited in the text & numbered in order to appearance with Arabic numerals. They should be self contained and have a descriptive title. Line drawing must be in Indian ink on good quality tracing paper. Scanned images of drawings, figures and photographs should be of very high resolution(minimum 600 dpi resolution).Figure caption should be supplied at the end of the paper and should be included as part of the graphic.

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Only standard units and symbols for measurements must be used.

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