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## International Journal of Food, Nutrition and Dietetics

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### **Probiotics: Nature's Food Supplement**

### E. Lakshmi

### Abstract

The nutritional profile and health implications of Probiotics as a functional food and preventive medicine requires great importance in developing country like India. The results of this review indicates signs of success of probiotic products in the prevention of pathogenic microorganisms in adults and children, control of lactose intolerance, developing the nutritional status of the population, allergy prevention and as a substitute for vaccine in developing countries.

Keywords: Probiotics; Lactose Intolerance; Functional Food.

### Introduction

A stable composition of micro flora is an important factor responsible for a balanced ecosystem and good gut health. The composition and the activity of intestinal flora are influenced by dietary factors like prebiotics, probiotics and symbiotics.

Prebiotics are starches, running in size from less sugar alcohols and disaccharides, to oligosaccharides and substantial polysaccharides. They are dietary mixes which upgrade the development and action of metabolic microbes. They are non-absorbable food elements which influence the host by specifically stimulating the development of health promoting bacteria in the intestinal tract, thus enhancing the hosts intestinal equalization [1].

Probiotics are the live microorganisms advantageous for wellbeing. It is derived from the Greek, word meaning "for life" which advanced to apply to those microbes that add to intestinal equalization. Probiotic food is characterized as a preparation of or a product containing live microorganisms in adequate numbers, which adjust the microflora of the host by implantation or colonization in a compartment and by that exert beneficial health effects on the host. The probiotic

E-mail: elakshmi20@gmail.com

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microorganisms ought to be nonpathogenic in nature; impervious to destruction by gastric acid and bile and ready to cling to intestinal epithelial tissue, colonize in the gastrointestinal tract, deliver antimicrobial substances, balance insusceptible reactions and impact human metabolic activities [2].

Quite often overlooked or disregarded is the way that gut and metabolic wellbeing depends to a great extent on way of life measures including eating practices and propensities, physical action, thinking capacity, social collaboration quality, and presentation to natural contaminations.

### Characteristics of a Good Probiotics [3].

The International Life Sciences Institute, European Food and Feed Cultures Association and FAO/WHO (2010) have launched the determination criteria for probiotics. one ought to think about wellbeing, practical and mechanical viewpoints as follows:

- Probiotics must from the human origin.
- It must be gram positive organism.
- Survival after passage through acid and bile.
- Adherence to the human intestinal cells.
- Able to grow in the gut.
- Should have defined dosage regimes and durations of use.
- Antagonism action against pathogenic and carcinogenic bacteria.
- It must show a specific health benefit measured by defined tests (in vitro, animal and/or human).

Author Affiliation: Head, Department of Nutrition, SRM College of Nursing, SRM University, Kattankulathur, Chennai, Tamil Nadu 603203, India.

**Corresponding Author: E. Lakshmi**, Head, Department of Nutrition, SRM College of Nursing, SRM University, Kattankulathur, Chennai, Tamil Nadu 603203, India.

- Must have defined dosage regimes and durations of use.
- Clinically proven documented beneficial health effects.



Fig. 1: Probiotic Foods

- Bifidobacterium: Bifidobacteria constitute a major part of the normal intestinal microflora in humans. Bifidobacterium have been found to grow better in human milk than in cow milk, which may be the reason for log count more growth of Bifidobacerium in the faeces of breastfed infants in comparison of bottle-fed infants. The faecal flora of formula-fed infants resembles more closely to that of adults. Fermented or unfermented dairy foods like milk, yoghurt, ice cream and cheese, are the most popular food vehicles that are used to deliver these cultures [4].
- Lactobacillius: These microorganisms utilize carbohydrates as the source of nutrition which helps in fermenting animals and plants products. Different functional effects of Lactobacillus on the host organisms comprises protection against infections, stimulation of immune system, reduction of incidence of diarrhea, reduction of allergy and others, have been demonstrated in vitro and in animal models [5].
- Saccharomyces: Saccharomyces genus includes two groups of species. Saccharomyces sensu is associated with the fermentation industry. Saccharomyces sensu lato, comprising species that are more distantly related to S. cerevisiae.

### Mechanism of Action of Probiotics [6]

Adherence and colonization of the gut: this is the initial phase in colonization and may help in modification of the host immune system. Studies have proved that probiotic microbes help to prevent the survival of pathogenic organisms, such as enteropathogenic escherichia coli and salmonella typhimurium. *Competition for nutrients and production of antimicrobial substances:* 

Probiotic strains further inhibit pathogenic organisms by competing for the limited substrates required for fermentation and by secreting antimicrobial products called bacteriocins.

Stimulation of mucosal and systemic host immunity:

Probiotics help to maintain a normal intestinal microflora. probiotics help to stimulate the immune system by detoxifying the colon contents thereby reduces serum cholesterol and promotes lactose tolerance to maintain intestinal health.

*Probiotics used in different disease conditions* [7]:

- Antibiotic-associated diarrhoea (AAD)
- Irritable bowel syndrome.
- Inflammatory bowel disease.
- Vaginal Infection.
- Celiac disease.
- Cancer.
- Gastrointestinal disease.

### **Nutritional Effect of Probiotics:**

Microorganisms in fermented foods or in the gut have shown to improve the quantity, bioavailability and digestibility of some dietary nutrients. Lactic acid produced during food fermentation by lactic acid bacteria leads to pH reduction, improvement of protein digestibility and calcium absorption. In addition, lactic acid bacteria was also shown to increase folic acid, niacin, and riboflavin levels in cultured dairy products with release of various enzymes and vitamins into the intestinal lumen [8].

At present, over 70 probiotic products are available all over the world commercially and include dairy products such as sour cream, ice cream, buttermilk, yogurt, milk powder and frozen desserts containing *Bifidobacteria* and *Lactobacilli*. Research has also shown potential to incorporate probiotics in non-dairy foods such as soy milk, soy cream cheese, chocolate and variety of juices such as tomato, orange, grape, carrot, beet and cabbage juice. Probiotics are also available in the form of capsules, tablets and powders. Overall the incorporation of probiotics in foods and their survival ability depends on the food matrix, composition, pH, storage facilities, thus making it a challenge for manufacturers [9]. Yogurt: Yogurt helps to build muscles. It is prepared by adding two strains of bacteria, Streptococcus thermophilus and lactobacillus bulgaricus, to pasteurized milk. The milk coagulates to a creamy product due to the lactic acid that is produced by the lactic acid producing bacteria.

*Sauerkraut*: Sauerkraut is prepared by fermenting cabbage. The lacto-fermented cabbage, contains natural compounds that fights cancer and reduces belly fat. Compared to yogurt unpasteurized sauerkraut contains more number of Lactobacillus bacteria to boost healthy flora in the intestinal tract.

*Kombucha:* Kombucha is a fermented drink with little effervescence. Fermented food based drink It made with black or green tea and a symbiotic culture of bacteria and yeast, known as a SCOBY.

*Kimchi:* Kimchi is an Asian matured vegetable dish, made with cabbage, radishes, and scallions. The particular red shading originates from a prepared glue of red pepper, salted shrimp, or kelp powder. The novel strains found in kimchi mends the gut, and enable to remain thin.

*Green Olives:* Olives are Salt-water brined in salt-water to undergo a natural fermentation, Acid produced by the lactic acid bacteria which are naturally present on the olives gives these little fruits their unmistakable flavor. Two strains of live cultures namely Lactobacillus plantarum and Lactobacillus pentosus, have been isolated in olives, and L. plantarum indicates incredible potential for getting flat stomach. A study published in the American Society for Clinical Nutrition. states that this of bacteria strain can balance the gut microbes and reduce bloating, particularly in people with irritable bowel syndrome.

*Natto (Japanese dish):* Natto is an important and healthiest food for women. It is made of fermented soybeans being a fermented food it contains highest dietary source of vitamin K2, a vitamin which is important for cardiovascular and bone wellbeing. Vitamin K2 also helps promote skin elasticity to prevent wrinkles. Natto is a good source of guthealing probiotics that keeps inflammation at bay.

Yakult is a another fermented milk drink containing a specific strain of *Lactobacillus casei* Shirota (LcS) with probiotic properties It was isolated by Dr Minoru Shirota in 1930.

*Kefir:* Kefir is a smoothie-like fermented dairy beverage helps to counteract the effects of lactose from milk that causes stomach-irritation. Ohio State University researchers found that kefir fermented drink can reduce bloating and gas poduced by lactose consumption by 70 percent. The bacteria in kefir colonize the intestinal tract. It is almost lactose free that makes it suitable for those who are lactose intolerant.

*Pickled vegetables:* Pickles made from vinegar do not contain any live bacterium To get the real health benefits from eating fermented foods, the pickled vegetables must be fermented and not just pickled.

*Miso:* It is prepared by fermenting soybeans, salt and a fungus koji (aspergillus oryzae). it is a total protein, containing nine essential amino acids. Miso keeps the digestive system under normal working condition, strengthens the immune system, and lessens the danger of various malignant growths.

*Sourdough bread:* It is the fermentation process where wild yeast and friendly bacteria break down the gluten and sugar in the wheat flour into good proteins, vitamins, and minerals. The "sour" taste of the bread is due to the presence of wild yeast. The starch is predigested by the bacteria hence this bread is much easier to digest than commercial white bread that is over-processed.

*Beet Kvass (Russian drink):* Beets are a good source of potassium and dietary fiber. Beet Kvass uses beets as the starch base and whey to increase the lactose based fermentation process. The flavor improves as the beets are left to ferment for longer period. Beets when fermented improve the digestive process.

*Cottage cheeses:* Cultured cottage cheese is rich in good bacteria and a step forward to the active survival of L. acidophilus and Bifidobacteria in acidic products similar to those present in yogurt and cultured buttermilk. The closed matrix structure of cheese, low acidity and high fat content protects the probiotic strains during cheese manufacturing, storage and in the gastrointestinal tract.

*Tempeh:* Tempeh is a fermented\_soy product prepared from yeast culture that has a neutral flavor, with tender and meaty. Bite with a neutral flavor. A standard serving of tempeh gives 16 grams of protein and 8 percent of the day's recommended calcium. It is gut friendly fermented food. Cheese: Aged and soft cheese such as cheddar, Gouda, parmesan, and swiss cheese contain beneficial bacteria that improves gut health. They are prepared by adding lactic acid bacterial culture to milk, to form lactic acid that causes the milk to form curds and whey. The longer the cheese ages, the more beneficial is the bacteria for the gut.

*Doogh:* Doogh is one of the natural probiotic for human health along with

food-producing commercial poultry. Doogh is a mixture of yogurt, water, mint or pennyroyal, and salt. Diced cucumbers are also added to produce a less watery food for summer when the human body balances heat and stress. It is consumed in Iran, Afghanistan, Armenia, Iraq and Syria.

### Conclusion

Probiotic strains can be successfully incorporated and manufactured into highly acceptable food products while retaining their viability and functionality. Preclinical and clinical studies have shown evidence of health benefits of probiotics. The development of successful probiotic products depends on the selection of probiotic strains for human consumption, therapeutic effect of the strain and survival and viability of the strain during consumption and storage. No more effective probiotic than lifestyle modification can improve the human gut and metabolic health.

### **Key Messages:**

Probiotic are "friendly bacteria" mainly used in developing countries in the form of dietary supplements and foods due to their health benefits. Yogurt is the most natural and healthy probiotics prefered.

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### Quint Essential Chillies of Northeast India

### Ruma Bhattacharyya<sup>1</sup>, Urmimala Baruah<sup>2</sup>, R.K. Bhattacharyya<sup>3</sup>

### Abstract

Globally, over four hundred varieties of chillies are grown. A good number of varieties are grown in countries of Asian continent including India. In fact, India is the largest producer and exporter of chillies. This paper attempts to review the varied classic varieties of chillies grown in the North Eastern Region of India. Nagaland state records the highest productivity (6.69 t/ha) of dry chilli in the country followed by Andhra Pradesh (4.29 t/ha) In addition to 'Bhut Jalakia', the world famous hot chilli, a good number of prime indigenous varieties of the region are: Dhan or kan Jalakia, Bhikue Jalakia, Jati Jalakia, Mem Jalakia, Ahom Jalakia, Totta Bias, Kharika, Krishna Jalakia, Suryamukhi, Bor Bih, Lata Bih, etc. Exploitation of the invaluable germplasm would pave the way for development of quality chilli hybrids.

Keywords: Capsaicin; Scoville Unit; Bhut Jalakia; Naga King Chilli; Hot Pepper.

### Introduction

Chilliis one of India's major export commodities and is cultivated in almost all parts of the country. The quintessential nature of chilli is primarily because of its duel uses both as vegetable and as spice. Interestingly chillies are used both in green and ripe conditions to impart pungency to food.In almost every Indian cuisine chilli is must because of the combination of colour, flavour, taste and nutritional value. Apart from rich source of vitamin C (111mg/100g), it has vitamin A (298 I.U/100g) and E, small quantity of proteins (2.9 g/100g), fats, carbohydrates and traces of minerals. Chillies are low in sodium and cholesterol free. It is valued for its pungency which is due to crystalline, acrid volatile alkaloid capsaicin (C18H27NO3), having diverse prophylactic and therapeutic uses in allopathic and ayurvedic medicine (Sumathy Kutty and Mathew, 1984).

These properties are also accorded due to the presence of phenolic compounds, carotenoid and capsaicinoid content of peppers (Hernandez *et* 

E-mail: rumab76@gmail.com

al., 2012; Zimmer et al., 2012). There are strong evidences that additive and synergistic interactions of t these phytochemicals significantly strengthen the protective effects against oxidative damage (Prakash et al. 2007). Some of the Medicinal properties of chillies are: stimulation of blood circulation, stimulative appetizer improving the digestion process, rich source of antioxidants as well as natural bactericidal property. Chillies also contain bioflavoids, plant pigments that some researchers elieve may help prevent cancer. Recent research indicates that capsaicin may act as an anticoagulant, perhaps helping to prevent blood clots that can lead to a heart attack or stroke. Incorporated into creams, capsaicinoids aleiate the burning pain of shingles and can help with the pain of arthritis. They may also reduce the mouth pain associated with chemotherapy. Commercially available poultices for relief of lower back pain also contain capsaicin (Anon., 2006). Additional uses include development of natural plant colour, pharmaceutical ingredients and as sprays for riot control and self-defence. A good number of value added chilli products have been developed. Some of the common popular chilli products are: dry chilli, dry chilli powder, chilli hot sauce, chilli hot and sweet sauce, chilli pickle, green chilli paste, red chilli paste, chilli flakes, chilli seed oil, green and red chilli chutney.

### Measurement of pungency in Chilli

In 1902, Wilbur Scoville had developed the method of measuring pungency in chilli and the

Author Affiliation: <sup>1</sup>Professor <sup>2</sup>Phd Scholar, Dept. of Food Science & Nutrition, Faculty of Community Science, <sup>3</sup>Professor Horticulture (Retired), Assam Agricultural University, Jorhat Assam 785013, India.

**Corresponding Author: Ruma Bhattacharyya,** Professor, Dept. of Food Science & Nutrition, Faculty of Community Science, Assam Agricultural University, Jorhat, Assam 785013, India.

heat value is expressed as Scoville Units (SHUs). The hot sensation of chilli is caused by a compound 'capsaicin' localized mainly in the placenta and the flesh of a chilli fruit. In Scoville's method, a measured amount of alcohol extract of the capsaicin oil of dried pepper is produced, after which a solution of sugar and water is added incrementally until the "heat" is just barely detectable by a panel of (usually five) tasters; the degree of dilution gives its measure on the Scoville scale (Asati et al., 2004). A sweet pepper or a bell pepper, containing no capsaicin at all which has a Scoville rating of zero, meaning no heat detectable. The heat of chilli is tested using spectrometer or HPLC (High Pressure Liquid Chromatography) to rate the chillies in Scoville units which indicate parts per million of capsaicin. The Scoville units of pure capsaicin are between 150,00,000-160,00,000. (Anon., 2006).

### **Origin and Distribution**

It is believed that chilli is originated Intropical South America (Greenleaf 1986), and are now grown worldwide. Chilli was introduced in India by the Portuguese from Brazil in 15<sup>th</sup> Century. Due to its taste, unlimited utility, adaptability in Indian climatic conditions, its cultivation gained popularity in 17<sup>th</sup> Century and a wide range of chilli varieties have been evolved with distinct characteristics. Today, India is the largest producer of chilli in the world and exports around 35000 tonnes of chillies worth Rs.80 crore in every year (Tiwari *et al.*, 2005).

## Present status of chilli production in the Northeast Region

In India the important chilli growing states are Andhra Pradesh, Telengana, Madhya Pradesh, West Bengal, Karnataka and North Eastern states. InIndia, Andhra Pradesh is leading state for area and production of chilli having an area of 25%

Table 2: Capsicum spp. available in Northeast India:

and 40-50% of total production Andhra Pradesh produces 883 thousand tonnes of dry chilli from an area of 206 thousand hectares against national total production of 1872 thousand tonnes from an area of 831 thousand hectares. Northeastern states produces 92.30 thousand tonnes of dry chilli from an area of 51.80 thousand hectares (NHB Database, 2017). Among the Northeastern states Nagaland produces highest (45.50 thousand tonnes) dry chillies followed by Assam (19.40 thousand tonnes). Though productivity of chilli in Northeastern region (1.78 t/ha) is lower than national productivity (2.25 t/ha), Nagaland state records the highest productivity (6.69 t/ha) in the country followed by Andhra Pradesh (4.29 t/ha). The area, production and productivity of Chilli (Dry) in Northeastern States are presented in Table 1.

**Table 1:** Area, Production and Productivity of Chilli (Dry) in Northeastern States

States	Area('000ha)	Production ('000t)	Productivity (t/ha)
Arunachal Pradesh	3.00	8.30	2.77
Assam	21.60	19.40	0.90
Manipur	6.50	3.90	0.60
Meghalaya	2.30	2.20	0.96
Mizoram	9.20	9.30	1.01
Nagaland	6.80	45.50	6.69
Tripura	2.40	3.70	1.54
Northeast total	51.80	92.30	1.78
India total	830.80	1872.00	2.25

Source: NHB Database (2017)

### **Taxonomy of Chillies**

Chilli (*Capsicum annuumvar accuminatum*), also called hot belongs to the nightshade family Solanaceae. There are about twenty two wild and five cultivated species of *Capsicum viz*. *C. annuum*, *C. baccatum*, *C. frutescens*, *C. chinense* and *C. pubescens* (Bosland 1994). Important chilli species of the region are presented in Table 2.

Scientific Name	Common Name	Comments
C. annum L.	Hot pepper, chillies, Sweet pepper,	Principal source of commercial dry chillies.
C. annum L. var. avicular	Bird pepper	Wild type, said to be progenitor of bell pepper.
C. annum var. grossum Sendt.	Sweet pepper, Bell pepper	Fruit contains no or low capsaicin
C. chinense Jacq	Pepper	Closely related to C. frutescens.
C. eximium Hunziker	Pepper	Wild type, pseudo self incompatible, related to C. pubescens.
C. frutescens L.	Tobacco pepper, Bird chilli	Widely cultivated in dry regions of India, highly pungent fruits used for sauce preparation.
C. minimum Roxb. Syn. C. fastigiatum Bhumme	Bird-eye-chili	Cultivated all across NE region but at very limited scale, closely resembles <i>C. annum</i> .
C. pubescens Ruiz. and Paron	Pepper	Introduced in India for breeding purposes

Source: Asati et al. (2004)



Naga King Chilli mainly belongs to the species *Capsicum Chinense* Jaqc. However, it has been reported that the chilli is a naturally occurring hybrid and occupies a taxonomic position between *C. chinense* and *C. frutescens*, clustering more closely with *C. chinense* group (Bosland and Baral 2007). The plant is a self pollinated species, but considerable cross pollination (up to 10%) may occur in presence of high insect population and this behaves as a semi-perennial plant if grown under optimal condition (Borgohain and Devi 2007). Similar in shape and size of Bhut Jalakia. The plant and fruit characters also show wide variability. Very hot and pungency is measured up to 1,382,118 SHU

*Bhikue Jalakia*: Grouped under the species *Capsicum pubescens*. Bell shaped like tomato with a flat base, 2-2.2 cm diameter, 1.5 cm long, smooth surface, dark red colour with characteristics aroma. Capsaicinoid content 0.92%.

Dhan or kan Jalakia: Popularly known as Bird's Eye Chilli. Grouped under the species *Capsicum frutescens*. Grown in Assam, Mizoram and in some areas of Manipur. Fruits tiny in size, elongated. 1-1.5 cm long 0.5 cm width, smooth surface, red colour, pungent with characteristics aroma. Capsaicinoid content 2.14%.

*Jati Jalakia:* Grouped under the species *Capsicum annuam.* Fruits are elongated, 2.5-3 cm long, 0.8-1 cm width, smooth surface, light red colour with characteristic aroma. Capsaicinoid content 0.51%.

*Mem Jalakia*: Grouped under the species *Capsicum frutescens*. Fruit small in size, elongated. 1.5-1.75 cm long 0.5-0.75 cm width, smooth surface, light red colour with characteristic aroma. Capsaicinoid content 1.38%.

Naga King Chilli Fig: Some chilli varieties of the Northeast India

### Chilli varieties of the Northeast India

The northeast region of India is recognized as hot-spot for chilli diversity (Mathur *et al.* 2000). In addition to 'Bhut Jalakia' and Naga King Chilli, the world famous hot chillies, a good number of prime indigenous varieties of the region are: Dhan or kan Jalakia, Bhikue Jalakia, Jati Jalakia, Mem Jalakia, Ahom Jalakia, Totta Bias, Kharika, Krishna Jalakia, Suryamukhi, Bor Bih, Lata Bih, Balijuri etc. A brief description of some of the varieties of the region are noted above.

*Bhut Jalakia:* It is also known as 'Ghost Pepper' as the fruits are very hot and pungent . Grown in entire Northeast India. The variety is under *Capsicum chinense* species. Fruits are unique among peppers with their characteristic shape and very thin skin. elongated, 5-7 cm long, 2.5-3 cm width, undulating rough surface, dark red colour, very hot and pungent with characteristic aroma. Capsaicinoid content 2.45%. It has pungency of 1,041,427 SHU.

*Naga King Chilli:* Also known as Naga Viper Pepper. Among the many landraces of chilli that are cultivated in the northeast, the Naga King Chilli is the best known worldwide. A number of variants of this chilli are observed in this region. *Ahom Jalakia:* Grouped under the species *Capsicum baccatum.* Rough surface with flat base, 2-3 cm diameter 2-2.5 cm long, base divided into three lobes, each haing 3-4 grooes, dark red colour. Capsaicinoid content 0.67%.

*Totta Bias:* The variety is under *Capsicum frutescens* species. Fruits are elongated, 4-5 cm long, 1cm width, smooth surface, orange to light red in colour. Capsaicinoid content 0.25%.

*Kharika Jalakia:* Grouped under the species *Capsicum annuam.* Fruits are elongated, slender, smooth surface, light red in colour, medium pungent.

*Krishna Jalakia*: Grouped under the species *Capsicum annuam*. Fruits are medium sized, smooth surface, black mixed with red in colour, medium pungent.

*Suryamukhi:* Grouped under the species *Capsicum annuam*. Erect growing Fruits are medium sized, smooth surface, red in colour, medium pungent.

*Lata Bih:* The variety is under *Capsicum chinense* species. Plants having slight creeping habit. Fruits are elongated, undulating rough surface, dark red colour, hot and pungent with characteristic aroma.

*Bor Bih:* The variety is under *Capsicum chinense* species. Fruits are elongated, undulating rough surface, dark red colour, hot and pungent with characteristic aroma.

*Balijuri:* Grouped under the species *Capsicum annuam*. Fruits are elongated, slender, smooth surface, light red in colour, medium pungent.

### Exotic chilli varieties in the Northeast India

In addition to the indigenous chilli varieties of the region a few exotic chilli varieties introduced and grown in the region are: Pusa Jwala, NP-46-A, Arka Lohit, Punjab Lal, Punjab Sindhuri, Jwalamukhi, Pusa Sadabahar as well as hybrid varieties like Sungrow-16 (developed by Sungrow Seeds), Tejaswini (developed by Mahyco Seeds) and INDAM 5(developed by Indo-American Hybrid Seeds)

### Hot pungent Chillies of the Northeast India

'Bhoot Jalakia' was placed among the hottest chilli varieties with 'Trinidad Moruga Scorpion' is an indigenous cultivator growing in Brahmaputra flood plain of Assam, Nagaland, Manipur and other part of Northeast India. The 'Bhoot Jalakia' came into limelight when Tezpur (Assam) based Defense Research Laboratory declared it is as the hottest chilli of the world which replaced the world famous Red Savina Habanera (scientifically *Capsicum Chinese*). Bhut Jalakia or Ghost pepper was the world's hottest chilli pepper, 401.5 times hotter than Tabasco sauce ranging from 2,500 to 5,000 SHUs. However, Bhut Jalakia was shortly superseded by the Infinity Chilli in early 2011, followed by the Naga Viper, then later the 'Trinidad Moruga Scorpion' in 2012, and finally the 'Carolina Reaper' on 7<sup>th</sup> August, 2013 (Guinness Book of World Records, 2013).

### Conclusion

Northeast India is famous for producing hot pungent chillies like Naga King Chilli or Naga Viper Pepper and Bhut Jalakia or Ghost Pepper. Although the Naga Chilli has originated from Nagaland the area under cultivation is lower in compared to other neighboring states. Bhut Jalakia, on the other hand, is grown relatively in larger areas in the region. The production of chillihas been increasing in all most all the states with the possible exception of Nagaland. Interestingly India's highest productivity of chilies in the state of Nagaland clearly indicates the production potentials of chillies in the Northeast. However, the share of the region in national production has not recorded a commensurate increase.

A pack of strategies for commercial chilli production in the region may be outlined as:

- to specifically identify the potential areas for commercial cultivation of chilli.
- thorough assessment of the indigenous chilli genetic resources for identification of resistant/tolerant sources against chilli pests and diseases as well as of potential capsaicin sources and their employment in strategic breeding programmes involving national/ exotic chilli varieties.
- genetic improvement of indigenous chilli varieties with an objective to upgrade them into a new commercial crop.
- technology development for low-cost hybrid seed production in chillies
- management of basic production inputsproduction of quality seeds.
- formulating chilli production strategies.
- working out the dynamics of production constrains in chillies more particularly combating pests like thrips, yellow mite and nematodes as well as diseases like

anthracnose, bacterial wilt, phytophthora blight, powdery mildew and chilli veinal mottle virus.

- revitalizing existing marketing channels and development of modern markets for chiili and various chilli products.
- revitalizing post harvest management through development of effective packaging and processing units.
- promotion of export and border trade in chilli.

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Indian Journal of Trauma and Emergency Pediatrics	Quarterly	9500	9000	742	703
Indian Journal of Waste Management	Semiannual	9500	8500	742	664
International Journal of Food, Nutrition & Dietetics	Triannual	5500	5000	430	391
International Journal of Neurology and Neurosurgery	Quarterly	10500	10000	820	781
International Journal of Pediatric Nursing	Triannual	5500	5000	430	391
International Journal of Political Science	Semiannual	6000	5500	450	413
International Journal of Practical Nursing	Triannual	5500	5000	430	391
International Physiology	Triannual	7500	7000	586	547
Journal of Animal Feed Science and Technology	Semiannual	7800	7300	609	570
Journal of Cardiovascular Medicine and Surgery	Quarterly	10000	9500	781	742
Journal of Forensic Chemistry and Toxicology	Semiannual	9500	9000	742	703
Journal of Global Medical Education and Research	Semiannual	5900	5500	440	410
Journal of Global Public Health	Semiannual	12000	11500	896	858
Journal of Microbiology and Related Research	Semiannual	8500	8000	664	625
Journal of Nurse Midwifery and Maternal Health	Triannual	5500	5000	430	391
Journal of Orthopedic Education	Carriannual	5500 1(E00	5000	430	391
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Journal of Practical Biochemistry and Biophysics	Semiannual	20400	23900	2003	2023
Journal of Psychiatric Nursing	Triannual	5500	5000	430	391
Journal of Social Welfare and Management	Triannual	7500	7000	586	547
Medical Drugs and Devices Research	Semiannual	2000	1800	156.25	140.63
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Ophthalmology and Allied Sciences	Triannual	6000	5500	469	430
Otolaryngology International	Semiannual	5500	5000	430	391
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Physiotherapy and Occupational Therapy Journal	Ouarterly	9000	8500	703	664
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### Women Entrepreneurship: Success Stories

### N. Rajani<sup>1</sup>, K. Geetha<sup>2</sup>

### Abstract

Women entrepreneurship is becoming significantly a progressive economic practice in India. It plays a prominent role in economic development through commercialisation of new ideas. Today, women entrepreneurs account for upto a third of all businesses operations in the formal economy worldwide. This research makes a significant contribution to an in depth understanding of, how the women are making efforts and exhibiting their capabilities for national economic development and for their own enhanced living standards by taking part in various economic activities. The study was carried out as a field study in chittoor district and personal interviews were carried out with women entrepreneurs to collect the case studies through a structured case - study tool. The case studies revealed that there is a substantial improvement in overall status of women in the family and they succeeded to prove their abilities as entrepreneurs.

Keywords: Entrepreneurship; Women; Economic Development; Decision Making

### Introduction

Entrepreneurship has been highlighted as a useful tool for fostering women's empowerment and hence the promotion of women entrepreneurship has been a prominent approach in recent days. In India the status of women has long been paradoxical. They were in the professions like medicine, teaching and politics. In some societies women are very powerful. In recent years women are taking part in entrepreneurial activities.

Women entrepreneurs are essential for a healthy entrepreneurial ecosystem and healthy economic growth. There is still a long way to go throughfemale - led businesses, only make up 30 percent of companies around the world. In India only 14 percent business establishments in the country are being run by female entrepreneurs and most of these women run enterprises are small - scale.

E-mail: homescienceoffice@gmail.com

The women entrepreneurs are increasing with the government implementing schemes.

Entry of women in entrepreneurial activities seen in respect of all kinds of women both in rural and urban areas (Rajani, 2008) [6]. Women are engaged in both traditional and non - traditional activities. The economic, social, religious, cultural and psychological factors affect organisation and success of women entrepreneurs (Habib, Roni, Haque, 2005) [4]. In the developing economies like India, women are involved in collaborative entrepreneurship to gain financial, social and psychological empowerment (Datta and Gailey 2012) [3]. The success stories in the entrepreneurial world improved their bargaining power in family, decision making power and understanding of personal actions. (Minniti, Arenius and Longowitz, 2005) [5]. Research conducted by Bosna and Harding,2006 found entrepreneurial orientation was higher among women in developing economies as compared to developed countries. A way into the entrepreneurship field have witnessed good business, social and personal life. (Ufuk and ozgen, 2001) [7]. Undoubtedly entrepreneurship is a result oriented profession to secure empowerment among women (Abbasian and Bildt, 2009) [1,2].

### Back ground of the study

There is a need for in-depth analysis of cases to understand the entrepreneurial process of women.

Author Affiliation: <sup>1</sup>Assistant Professor, Dept. of Home science, Sri Padmavati Mahila Visvavidyalayam (Women's University) Tirupati, Andhra Pradesh 517502, India. <sup>2</sup>Dietitian, Dept. of Dietetics, Sri Venkateswara Institute of Medical Sciences (SVIMS), Tirupati, Andhra Pradesh 517507, India.

**Corresponding Author: N. Rajani**, Assistant Professor, Dept. of Home science, Sri Padmavati Mahila Visvavidyalayam (Women's University) Tirupati, Andhra Pradesh 517502, India.

The paper highlights the cases of successful women entrepreneurs who have struggled and made a mark for themselves in the society. The present study which was descriptive-cum- exploratory in nature has been conducted through survey method. Totally 802 women entrepreneurs registered under various government schemes in chittoor district of Andhra Pradesh were surveyed for their productive activities.

The details of women entrepreneurs involvement in each sector was given in table 1:

Table 1: Sector wise details of women entrepreneurs

S.No.	Sector	Sample size				
_		Micro	Small	Medium	Large	Total
1	Service	110	36	1	1	148
2	Production	175	8	4	3	190
3	Business	232	221	11	0	464
	Total	517	265	16	4	802

Among this larger number of women included in the study based on their reponses and economic productivity along with entrepreneurial satisfaction four women were selected for in depth case analysis by the researcher. Case studies were presented in greter detail below.

### **Case Studies**

### *Case study* 1 – *Syamala Sarees (Business Sector) Socio-economic demographic profile*

Syamala resident of Puttur is a saree and garment seller. She is a 46 years old, married woman with two children aged 24 years and 21 years respectively. Her father and her brothers are in textile business. Her sisters are house wives. Syamala studied up to graduation and completed a diploma in textiles and clothing. Her husband is a realtor and she is living in a nuclear family. She has a shop and conducts her business from home as well. Syamala belonged to middle class family and has been in business for last 10 years and is contributing to family income regularly.

# Business idea conception and Entrepreneurial Productivity

After marriage Syamala came to Puttur with her husband. Syamala faced financial problems in her family after birth of her children. Her husband also had problems in his business. Her household responsibilities and expenses both were increasing. Syamala thought of doing some work that would enable her to earn some income for the family. Her brother gave her an idea to start selling the sarees. In the beginning she started her business from home. She along with her brother went to different shops in Hyderabad, Surat and Chennai to know about different sarees. She bought sarees at wholesale rate and started her business by investing Rs.40,000/-.

Initially she faced problems such as quoting price, bargaining, recovery etc. since she was new to the business. But she was fortunate to get the sizeable number of customers. During the course of time she got experience of the business and knowledge regarding preferences of customers. By recognising the taste of customers and introducing new varieties of dresses slowly she became more popular and started a shop to overcome her business and personal problems. But when she was at the peak, she faced some family problems also and was unable to pay attention to her business and had to bear loss also. Even then she didn't give up her business, she approached a bank with the help of a family friend and succeeded to get financial support of Rs.10, 00,000/-. Again her business started growing and thereby earnings also increased. Due to her skill, talent and determination her business has made good progress.

Her children are grown up now. Both her children along with her husband are helping her in business. Along with sarees and dresses store, she started a fancy store with women accessories. She registered her business and is a regular tax payer since establishment. She is satisfied with the support given by financial institutions to encourage women entrepreneurs.

#### Future plans

Her plan is to open big show room so that her children may not face any problem in future to continue her business.

### Impact

Syamala feels that she is self sufficient now and stated that her business has not only given her money but good status in family as well as in the society.

### Case analysis

Syamala entered into entrepreneurial field to overcome her financial problems. Her desire to do something to support her family motivated her to start her business. Her management, timely decisions, human relation skills combined with family support made her a successful women entrepreneur.

# Case study 2 - Padmavathi Footwear (Production Sector)

### Socio-economic and demographic profile

Padmavathi is a resident of Lakshmipuram a semi urban place near Tirupati. She is in her midfifties and has studied upto 10<sup>th</sup> standard. Both her parents who were engaged in leather business expired. She is the only daughter to her parents and she had observed as well as participated in their business activities. She is married and her daughter is 32 years old. And lives in a nuclear family with her husband and daughter. Her husband works in a private company. From the brief history of Padmavathi, given above it is evident that she had some business experience as she helped her parents in their business.

# Business idea conception and Entrepreneurial Productivity

Padmavathi is engaged in leather chappals making. As her husband's income was insufficient, strong need was felt by her to supplement the family income. As she is not highly educated, she was worried whether she will be able to fulfil her aim. She has good contacts with neighbour women who are engaged in different entrepreneurial activities.

She got inspired by those women to venture into a business. But she didn't want to imitate them by starting the same activities in which they were involved. So, she started exploring different business opportunities. At this point one of her friends gave her information about training in leather chappals making. She underwent 6 months training in chappals making as she was very interested in the activity. She wanted to be innovative in the selection of her business idea. After the completion of the training, she waited for 2 months. The strong desire to start the unit immediately, lead her to avail credit from private banks at low interest and start the unit with an initial investment of Rs.2,00,000/-. To get loan from the bank, she made several visits to bank and convinced them. She made efforts to know about the schemes which provide finance. She expressed her satisfaction for the support she got from bankers and other officials. Padmavathi decided to start the unit as she was confident and had full support of her husband and friends. At every stage she discussed her ideas with her husband. She didn't employ any worker but she

gathered 15 women and formed them as a group and trained them in the activity. With the help of this group she manage the business. She paid them piece rate i.e. for each pair of chappals.

Padmavathi was involved in the main activities of the unit such as purchase of raw material, quality control of the products and sales. She supplies the chappals produced by her team to the wholesale shops in Renigunta road. Apart from this technique of sales she thought of employing a person to sell the products. After one year of start-up, she employed a person to help her in sales by approaching some institutes. Her marketing techniques improved her sales beyond her expectations. At present she is working to meet the demand of the market. At the end of the day with the leftover raw material she is creatively making key chains. After five years of experience, presently she is getting Rs.50,000/- per month as profit. She is happy for her earnings but she has a desire to earn more amount.

### Future plans

She has plans to start another branch in Chittoor town in future. She has plans to start production of leather bags, shoes also. She is in search of a proper working place for expansion of her unit and she is confident that she can start within a short span of period.

### Impact

After starting the enterprise Padmavathi became confident of her productive skills. Padmavathi improved her status of living from a thatched house to a pucca building. Through her unit, she not only improved the income of the family but also acquired a special status in the society.

### Case analysis

Though Padmavathi is not very literate woman, her self confidence, interest and need combined with husband's support and peer group influence encouraged her to initiate the venture. She approached and convinced the bankers in getting loan. She was innovative in selecting a business idea other than what her friends and neighbours are engaged. Hard work, good production and management skills combined with cooperation of her husband and group members lead her towards success. She is creative in chappal making and in marketing. Though she started the venture with an aim to supplement the family income, she is able to earn more than enough and she is also saving for

the future. She has plans to expand and diversify the business investing her savings.

Padmavathi fulfilled her desire of becoming her own boss and she has a feeling of achievement. She is member of mahila club and other business organisations. After starting the business, Padmavathi's economic and social status of herself and her family has improved.

### **Small Scale Enterprises**

### Case study 3 - Slim World (Service Sector)

Socio - economic - demographic profile

Mamatha is a resident of Tirupati town. She is a 52 years old married women blessed with one girl child 21 years old, who is studying medicine at Chennai. Her father and brother had their own business. Her mother is a housewife. Her husband is TTD special class contractor. She was brought up in a joint family, but now she is in a nuclear family. She is a Post graduate and worked as Assistant professor and she resigned her job to become an entrepreneur. She also worked as Sarpanchat Muthyalareddypalle. She got a diploma in cosmetology before starting her parlour.

### Business Idea Conceptionand Entrepreneurial Productivity

Mamatha started her beauty parlour 18 years back. She had the idea of doing something on her own before her marriage itself. But she didn't put her idea into action as she was still continuing her studies. As soon as she finished her college, she got married and joined as faculty member in the university.

In the university she attended to a one month EDP organised by Canadian International Development Agency and motivated by the programme to be her own boss. She discussed about her idea of starting business with her husband and family members, when she got acceptance from them she decided to leave her job and started identifying the opportunities. At that point of time there was a great demand for beauty parlours and slimming centre. But she was disappointed after knowing that she stepped into fully orthodox family. Her in laws were against her ideas. Though she was disappointed, she didn't give up her ideas but waited for an appropriate time. According to her, she was lucky to some extent as her husband was favourable to her ideas. At that time one of the cousins used to stay at Hyderabad. Mamatha went to Hyderabad along with her husband to see her

cousin. There, she was attracted and impressed by the beauty parlour, situated at neighbours next to her cousin's house. She wanted to be trained as beautician. As her husband was in her line of thinking, he left her at Hyderabad for undergoing training. When Mamatha returned home after her successful completion of 6 months beautician course, she received many scoldings from her in laws, but she didn't care as her husband was in favour to her idea. But she was not daring enough to start the beauty parlour. After one year they lived in a separate house and not with her in laws. She recognized the people's health consciousness and decided to start "slim world" which will take care of beauty and wellness. She had equipped her enterprise with latest equipment, air conditioners and good interiors etc.

She started her parlour with just Rs.10, 00,000/as a starting capital. This amount was provided by her husband. Her parlour was the best parlour in Tirupati town. So, at the start up itself she had high demand and she is maintaining her demand till now by offering the quality services. She is having full and continuous support and encouragement from her husband. She is enjoying full freedom over her income and takes independent decisions on how to spend it.

Mamatha did not face any serious business problems but she had to face family problems (from in laws) which she confronted boldly. Her enterprise had flourished over a period of time. She opened branches in Tirupati, Chittoor and Madanapalle. In order to update her business knowledge she regularly attends various seminars and workshops and introduces new techniques accordingly. This has brought good will to her business. She didn't face any problem in getting loan through State Finance Corporation. She got "Best Women Entrepreneur" award and also "Women of Success" award.

### *Future plans*

In future Mamatha wishes to develop her business not to earn more money but to achieve something great.

### Impact

Through beauty parlourMamatha enjoys good status in the family and had a special identity in society. Many young girls of her community admire her and she is role model for them. She feels proud of her status.

### *Case analysis*

Mamatha entered into the field of entrepreneurship to fulfil her inner desire to be her own boss and to lead an independent life. Her strong desire and confidence combined with husband support helped her achieve success and satisfaction in her business. She acquired skills to manage her enterprise, this has helped to build her confidence.

Mamatha not only created self employment for herself but also provided employment to others through her venture. Business showed very positive impact on her personal, social and economic life.

# *Case study 4 - Ajantha Foot Wear (Production Sector)*

Socio - economic demographic profile

Vijaya, aged 54 years, is a successful entrepreneur with her talent to do business in shoe making. She resides in Yasodha Nagar, T.K. Street, Tirupathi. She belongs to a high social class and had studied up to 10<sup>th</sup> standard. However, she didn't hesitate to jump into the business to prove herself.

Her husband was a lecturer in S.V University, later he rose to the position of the principal and after his retirement he also found a place in his wife business. She has three sons. Two of them are settled in the same business. She has a strong family support in starting and running the enterprise.

### Business Idea Conception and Entrepreneurial Productivity

After her marriage she didn't limit herself to the role of home maker. She had good surroundings of positive thinking people and her friends were active in different activities. She herself was a dynamic person. She was encouraged by her husband, friends and relatives to do something. She wanted to spend her time productively.

She and her husband tried to explore various opportunities and after consultation with many people they established a business in shoe making with all available resources. With the strong support of family, she established a shoe making company at Avilala, an village adjacent to Tirupathi, with a capital of 25 lakhs, well equipped machinery, own building and work force with 20 people. She took financial assistance initially from State Financial Corporation. In the beginning she faced difficulty in approaching the officials for financial assistance and dealing with dealers for raw material. But her husband stood her side all times and made her to do things on her own. Initially she faced problems in marketing products and to maintain quality, to in cutting of the leather and stitching of shoes. She should have knowledge of everything. So, she went to cobbler and learnt how to stitch chappals. Her efforts to gain more knowledge gave her confidence and it helped her to maintain quality and market her products.

After some successful years in her enterprise she came to the point of 10-25 crore worth production per annum. Her husband joined her after his retirement and her two sons were also there with her with their high education and managerial capabilities to maintain their business.

In 2009 she started another shoe making industry in Tamilnadu. Her sons are taking care of marketing.

At the beginning the productivity was little and gradually it reached to its high level. She never felt it's hard to face challenges in running the enterprise due to her own support systems.

Her market is extended to all towns and mandal quarters of Chittoor. Even Tamilnadu is also became a part in her market. From 1987 onwards she has been striving to be a successful woman and thus she proved herself. In her journey as entrepreneur she attained good contacts and social status.

### Future plans

Now she has plans to extend her products to all types of leather articles. To reach her products to farther areas, wants to establish branches in all district headquarters and Karnataka state also. To inculcate new technical skills. She is encouraging her workers and managers to undergo training, she wanted to start a "day care centre" for the welfare of women employees.

#### *Case analysis*

Driven by passion and good surroundings, Vijaya's story stands as a good example to the amateurs. Her life is fully equipped but she did not confine herself to the four walls. She wanted to prove herself. Her dynamic nature led her to the unbeatable ends. Her family background, her social status and education helped her to elevate herself. The fire with in her made to explore the opportunities and she started her beginning in little numbers. From the beginning she didn't hesitate for anything. She got help from all means and actually she utilized them in a fruitful manner.

Actually this is a story of a passionate woman who has with sufficient resources and family support. She is woman with Economic and Social satisfaction.

### Conclusion

In depth analysis of these 8 case studies of women entrepreneurs revealed that the entrepreneur has the power to drive changes in the structure of a society. Women entrepreneurs are changing the face of the entrepreneurship field by entering predominantly a male sector. The case studies proved that women entrepreneurs are filling the gap left by dwindling skills and technical expertise by taking up careers in varied enterprises like education, cosmetology, food sector etc. Need for achievement and accomplishment of a goal to support their families is important to women entrepreneurs in the present study. Under support groups the case studies evidently showed that spouse, family, friends and support systems helped them to start, establish and managing enterprises. Women with varied literacy levels not only improved their skills but also empowered themselves by establishing good networks and attending two training programmes and workshops.

In the present study all women entrepreneurs demonstrated personal achievement of goals and share pride in what they are doing. They believed in their strength in dealing challenges and they do not want to rest on their laurels. They have dared to move into expansion of their enterprises.

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### Article in supplement or special issue

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### Reference from electronic media

[9] National Statistics Online – Trends in suicide by method in England and Wales, 1979-2001. www. statistics.gov.uk/downloads/theme\_health/HSQ 20.pdf (accessed Jan 24, 2005): 7-18. Only verified references against the original documents should be cited. Authors are responsible for the accuracy and completeness of their references and for correct text citation. The number of reference should be kept limited to 20 in case of major communications and 10 for short communications.

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