

**“EFFECT OF ORGANIC AND INORGANIC  
FERTILIZERS ON GROWTH AND GREEN  
FRUIT YIELD OF CHILLI”**

**BY**

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**B. Sc. (Agri.)**

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VIT

**DISSERTATION**

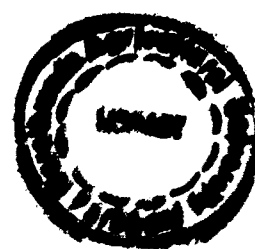
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**Dedicated To**

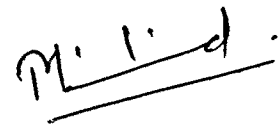
***My Mother and Father***

## CANDIDATE'S DECLARATION

*I hereby declare that this dissertation or part thereof  
has not been Previously submitted by me for  
a degree of any other institution  
or University.*

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## **CERTIFICATE - I**

This is to certify that the dissertation entitled **“EFFECT OF ORGANIC AND INORGANIC FERTILIZERS ON GROWTH AND GREEN FRUIT YIELD OF CHILLI”** submitted to Marathwada Agricultural University, Parbhani in partial fulfillment of requirement for the degree of **MASTER OF SCIENCE** in the subject of **HORTICULTURE** embodies the result of bonafide research work carried out by **Mr. MILIND NAGNATH VITKAR** under my guidance and supervision. No part of this dissertation has been submitted for any degree or diploma of any university or institutions.

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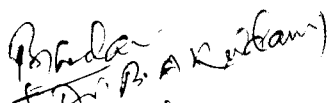


**(Dr. G. S. Shinde)**

**Research Guide**

## CERTIFICATE - II

This is to certify that the dissertation entitled "EFFECT OF ORGANIC AND INORGANIC FERTILIZERS ON GROWTH AND GREEN FRUIT YIELD OF CHILLI" submitted by Mr. MILIND NAGNATH VITKAR to the Marathwada Agricultural University, Parbhani in partial fulfillment of the requirement for the degree of **MASTER OF SCIENCE** in the subject of **HORTICULTURE** has been approved by the student's advisory committee after oral examination in collaboration with the external examiner.



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Place : Parbhani

Date :



(VITKAR M.N.)

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*Introduction*

## CHAPTER I

# INTRODUCTION

Chilli (*Capsicum annum* L.) belongs the family solanaceae is one of the important spice cum vegetable crops. It is grown on commercial scale as a cash crop in India. It is grown throughout the year and used to green and red ripe dried stages for their pungency and colour. It is an integral part of Indian diet and used at all time in every Indian home. The chromosome number of chilli is  $2n = 24$  and originated from tropical America, especially Brazil. Introduction of chilli in India is believed to be through Portuguese in seventeenth century.

The pungency is due to the alkaloid 'capsaicin' and red colour in fruit is due to the pigment 'capsanthin'. The green chillies contain rutin which has medicinal value (Singh, 1998). The capsaicin is found to have greater medicinal value especially as piaster, lozenge, stimulant, tonic and rebufociont. It internal use is also found to cure harseness, sour throat and snake bite (Pawade, 1987). The chilli is good source of vitamin 'A' and vitamin 'C'. Red dry fruit contains proteins and minerals (Kaur *et al.*, 1980 ). Green fruit of chilli are also consumed as salad with peels and used in preparation of pickles, ketchup, squses and various dishes.

India ranks second next to China in the vegetable production in the world. The area under vegetables in India is estimated around 6.2 million hectare with annual production 71.66 million tonnes of vegetables (Anonymous, 2003). Important chilli growing states are Andra Predesh, Maharashtra, Orissa, Karnataka, Tamil Nadu, Gujrat and

Rajasthan. Maharashtra produces 57.7 thousand tonnes of chilli from area 101.1 thousand ha with average yield of 5.70 q/ha (Anonymous, 1998-99). Nashik, Ahmednagar, Solapur, Aurangabad, Nanded and Amravati are major chilli producing districts of Maharashtra (Peter, 1999).

The vegetable production is gradually increasing the world demand is also going up. The estimated world import of chilli is one lakh tonnes which is 22.22 per cent of total world import of spices. India exports only 2.75 to 7.50 per cent of its total production of chillies. India made the record of export of 51900 tonnes of dry chillies in 1996-98 (Peter, 1999).

The yield of chilli can be improved by developing high yielding varieties through breeding and using efficient management practices. In management practices besides other cultural practices use of optimum quantity of fertilizers without deterioration of soil and quality of produce is very important.

In traditional farming manures and cowdung are used nutrient source to the crop to supplement the natural supply available through soil and atmosphere. This system of low nutrient supply can only lead to low productivity of crops. In order to satisfy the demand of increased population use of high yielding varieties and supply of more amount of nutrients are needed. Similarly, care also taken that due to use of only chemical fertilizers the soil health and quality of produce is deteriorated and sustained yields are obtained.

Due to the ever increasing demand for crop nutrients in generally low fertility situation in India, accompanied by the high cost of non-renewable chemical form of nutrients and the concern about environmental degradation and pollution, the

need for supplementary cheaper sources of nutrients is recognized organic farm of nutrients through crop residues, dung, city compost, neem cakes, green manuring and the use of biofertilizers constitute a potential renewable source of nutrients supply to the crop under all situation (Motsara, 1999).

The interaction of chemical fertilizers with the soils is considered less favourable to the soil environment in comparison to organic sources of nutrients which supply not only major but also trace elements to the plant.

Therefore, the adoption of an Integrated Plant Nutrient Supply System is becoming more popular as it is scientifically sound and assures sustainable development in agriculture.

Vegetables respond to addition of nutrient through Neem cakes, FYM, green manuring and chemical fertilizers (Sharma and Rana, 1993). Peticularly chilli needs heavy manuring for sound plant growth and high yield. The use of judicious combination of organic and inorganic fertilizers source is essential not only to maintain the soil health but also sustain productivity (Malewar *et al.*, 1998).

Soil is inherent source of organic matter, major nutrients as well as micro nutrients and also beneficial organism. However, these physical, chemical and biological properties of soil are not maintained these three qualities of soil supplementary application organic manure is necessary.

However, 100 per cent supply of nutrients through organic sources is also difficult. Therefore, for more production and soil health the proper combination of organic and inorganic fertilizers is needed. Taking in consideration these facts present

study was undertaken to decide proper combination of organic and inorganic fertilizers for growth and production of Pusa Jwala chilli.

The investigation reported in this dissertation were designed to obtain some basic information on application of organic and inorganic fertilizers and their combinations on growth and yield of chilli, with following objective:

- To assess the effect of organic and inorganic fertilizer and their combination on growth and green fruit production of Pusa Jwala Chilli.

*Review  
of  
Literature*



## CHAPTER II

# REVIEW OF LITERATURE

Organic and inorganic fertilizers play an important role in increasing growth, yield and quality of different vegetable crops. The research in respect of organic and inorganic fertilizers effect in chilli Var. Pusa Jwala was under taken in Horticulture Research Station, Sub-campus, M.A.U., Parbhani. Such treatment effect on growth, yield and quality of chilli and other vegetables were also studied previously by various scientist.

The literature in respect of chilli and the relevant research work in vegetables was reviewed and given under suitable heads in this chapter.

### **2.1 Effect on vegetative growth of plant**

#### **2.1.1 Effect on height of the plant, spread of plant and number of branches per plant**

Amruthalingam (1988) observed that inoculation of *Azospirillum* to seed, oil and seedling with 70 kg N/ha and NAA 5 ppm increased the plant height, spread, number of primary, secondary and tertiary branches in chilli.

✓ Damke *et al.* (1988) maximum plant height was observed in chilli on plot receiving 9 t FYM/ha + 50 : 50 : 50 kg NPK/ha as basal dose.

Darley *et al.* (1988) observed that substrate application of half N (50 kg) as poultry manures and half N (50 kg) as urea showed higher plant height in brinjal.

Lenka *et al.* (1989) studied four levels of N (0, 50, 75 and 100 kg/ha) and P<sub>2</sub>O<sub>5</sub> at 2 levels (30 and 60 kg/ha) and K<sub>2</sub>O at constant level of 40 kg/ha in okra and observed that N and P significantly increased plant height, yield and its attributes. Application of 100 kg N/ha and 30 kg/ P<sub>2</sub>O<sub>5</sub> kg/ha gave satisfactory growth and yield.

Paramaguru and Nataranjan (1993) revealed that the treatment *Azospirillum* + 56 kg N/ha recorded the highest plant height and number of primary branches per plant in chilli.

Mallangouda *et al.* (1995) showed that application of NPK + FYM improved the plant height and number of branches per plant of capsicum in companion cropping.

Fugro (1996) revealed that application of Neem cake 2t/ha+75:25:25 kg NPK/ha showed maximum plant height of chilli while vermicompost 10t/ha showed minimum plant height. The number of branches per plant were maximum at plot receiving Vikas 1.5t/ha + 75:25:25 kg NPK/ha and were minimum at plot receiving 30 t FYM/ha alone.

Tupe (1996) reported that application of Celrich 2 t/ha + RDF (100 : 50 : 25 kg NPK/ha) boosted the height of the okra plant than FYM and glyricidia alone or their combination with RDF.

Raut (1998) concluded that application of 75 kg N/ha + Biofertilizer + FYM was found to be superior for increasing the height of okra.

Umap (1998) worked on chilli and reported that the plant height and number of branches per plant in chilli were maximum at plot applied with super digested litter compost of

Shivar @ 15 t/ha and Karanj @ 15 t/ha with 50 per cent NPK/ha.

✓ Atiyeh *et al.* (1999) found that tomato plants grew better in 100 per cent vermicompost than in 100 per cent horticultural commercial medium. Substitution of 10, 25 and 50 per cent vermicompost for the same amount of commercial medium stimulated plant growth, resulting in significant increase in plant height and root and shoot biomass.

✓ Barekar (2000) observed that application of 150 : 50 : 50 kg NPK/ha + 10 t FYM/ha in combination with PSB biofertilizer were effective for enhancing height of plant number of branches per plant and diameter of stem in chilli.

Gadambe (2003) recorded that highest plant height and maximum plant spread was found in chilli with application of 50 per cent RDF + 50 per cent Neem cake.

### **2.1.2 Effect on leaves**

Cerna (1981) observed that nutrient deficiency markedly affected leaf development at reproductive organ. Application of N and K in absence of FYM retarded the formation of vegetative organ and subsequently reproductive organ. FYM favourably affected vegetative mass and leaf unit area in capsicum.

Abusaleha and Shanmugavelly (1988) observed that number of leaves, in okra were accounted by application of both inorganic and organic form of nitrogen.

Khandekar and Nigam (1996) revealed that in ginger, FYM at 6 t/ha gave more leaves and tiller/plant.

Shelke *et al.* (1999) found that in brinjal maximum number of leaves per plant (45.3) were obtained with

application 40 per cent N through urea combined with 60 per cent N through poultry manure.

Shiyou *et al.* (1999) found that in capsicum, leaf number/plant was 17.8 in plants supplied with organic manure, compared with 15.2 in plants supplied with inorganic fertilizer and 14.3 in plants with no fertilizer application.

Rafi (2001) reported that, maximum number leaves per plant (118.10) was recorded in tomato with application of 50 per cent RDF + 50 per cent FYM.

Subba rao and Ravishankar (2002) found that maximum number of leaves per plant (124.6) were observed with application of FYM combined with vermicompost in brinjal.

## **2.2 Effect on reproductive growth**

### **2.2.1 Days to flower initiation, 50 per cent flowering, days fruit set to harvest and per cent of fruit set**

Khan and Suryanarayana (1977) reported that the highest level of 120 Kg N/ha with 45 Kg each P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O per hectare resulted in earlier flowering in chilli.

Amirthalingam (1988) observed that application of *Azospirillum* inoculation to seed, soil and seedling with 75 Kg N/ha and NAA 5 ppm induced earliness in first flower appearance and 50 per cent flowering in chilli.

Darley *et al.* (1988) indicated that brinjal plants supplied with inorganic form of N showed early flowering when compared to organic sources or their combinations.

Kumaran *et al.* (1998) revealed that tomato plants supplied with organic form of fertilizers showed earliness, assessed by days taken for 50 per cent flowering.

Raut (1998) observed early flower initiation when 10 t of FYM/ha was applied alone to the okra plants.

Nanthkumar and Veeraragavathatham (1999) revealed that the number of flowers per plant, per cent fruit set, number of fruits per plant and fruit weight of brinjal were highest when organic and inorganic fertilizer were applied in combination.

Barekar (2000) observed earliness in 50 per cent flowering of chilli plants supplied with 150 : 50 : 50 kg NPK/ha + 10 t of FYM/ha in combination with PSB biofertilizer.

Gadambe (2003) observed that early flower initiation was found in chilli with application of 50 per cent RDF + 50 per cent Neem cake.

## **2.3 Effect on yield**

### **2.3.1 Number of fruit per plant, weight of fruit per plant**

✓Khan and Suryanarayana (1977) observed that the highest level of 120 kg/ha of nitrogen with 45 kg/ha each phosphorus and potassium resulted in maximum number of fruits per plant, maximum fruit size in terms of length and girth and highest yield of chilli per unit area.

Abusaleha and Shanmugavelu (1988) revealed that the number of flowers per plant, number of fruits per plant and

length and girth of okra fruit were significantly influenced by application of 20 kg N/ha as poultry manure in combination with 20 kg N/ha as ammonium sulphate than the other combination of ammonium sulphate with FYM and horse manure.

✓ Kumaran *et al.* (1998) revealed that application of organic manure combined with recommended dose of inorganic fertilizer gave more, fruit weight and number of fruits per plant of tomato.

Umap (1998) found that the number of flowers, fruits per plant and length and breadth of fruits were higher in chilli when plants applied with superdigested litter compost of Shivar @ 15 t/ha and Karanj @ 15 t/ha with 50 per cent NPK/ha.

✓ Nanthakumar and Veeraragavathatham (1999) revealed that the number of flowers per plant, per cent of fruit set, number of fruits per plant and fruit weight of brinjal were highest when organic and inorganic were applied in combination.

✓ Barekar (2000) observed that the highest the number of fruits per plant of chilli fruits were found at plants supplied with 150 : 50 : 50 kg NPK/ha + 10 t FYM/ha in combination with PSB as a biofertilizer.

### **2.3.2 Effect on yield**

✓ Subbiah *et al.* (1982) found that the fruit yield of chilli was highest (60 t/ha) when plot was applied with 12 t of FYM + 50 per cent RDF/ha. The control plot yields were comparatively low (29.7 t/ha).

Valsikova and Ivanic (1982) observed that in the plot applied with NPK + FYM yields were (40.55 t/ha) more than that of plot without FYM (29.60 t/ha) and proportion of first grade chilli fruit in these treatment was 60.49 per cent and 55.25 per cent, respectively.

✓Narasappa *et al.* (1985) observed that when nitrogen at 50-250 kg/ha was added to basal dose consisting of P and K at 100 kg/ha + FYM at 10 t/ha, the yield of green chilli fruits was increased with increased dose of N upto 150 kg N/ha and then yield was declined.

Abusaleha and Shanmugavely (1988) revealed that application of 20 kg of N through ammonium sulphate + 20 kg of N through poultry manure gave the highest yield of okra (18.09 t/ha).

✓Damke *et al.* (1988) observed that the yield of dry chilli pod were highest in plot applied with 9 t/ha FYM + 50 : 50 : 50 kg NPK/ha as basal dose.

Darley *et al.* (1988) found that the highest yield (51.03 t/ha) of brinjal fruit was recorded by the plants supplied with 50 kg N poultry manure and 50 kg N as pig manure and 50 kg N as urea (45.80 t/ha).

Hilman and Suwandi (1989) observed that the highest yield of 2.16 kg/plant was obtained sheep manure at 30 t/ha in tomato.

Malik and Lal (1989) conducted field trial in India and found reduction in *Eurias vitella* infestation and increase in yield in okra by application of neem oil cake (Neem seed cake) and fertilizer @ 2.5 kg each/200 sq.m. flats or neem seed cake alone @ 5 kg/plot.

Mumiz and Silva (1989) showed that no marked difference were observed between two treatment as goat manure at 20 t/ha and goat manure 20 t/ha + 270 : 630 : 270 kg/ha for Ruby king to 10152 kg/ha for Agronoico-104.

Surlekov and Rankov (1989) found that the application of NPK at 100 : 80 : 100 kg/ha + 20 t FYM/ha with irrigation produced highest average yield in capsicum, this yield was 73.4 per cent that of unfertilized control.

✓ Nair and Peter (1990) observed that the application of 15 t/ha FYM + 175 : 40 : 25 kg NPK/ha gave the highest yield of chilli and increased the storage of green fruits.

✓ Natrajan (1990) found that the basal dose of NPK 75 : 35 : 33 kg/ha + 25 t/ha FYM through soil gave the highest yield of dry chilli (1.83 t/ha) than that of control.

Dubey *et al.* (1991) tested nine plant extracts and compared with chemical insecticide sprays against the noctuid *Heliothis armigera* on chick pea in Madhya Pradesh (India) in 1984-85. Among the plant extract, NSKE and neem rind extract, due to their antifeedant action provided maximum protection resulting in higher yield.

✓ Anonymous (1993) observed that fully dung + urine applied to okra gave maximum fruit yield (92.25 t/ha) followed by half dung + urine (78.88 t/ha) over the control.

✓ Hsieh Ching Fang *et al.* (1994) observed that yield of sweet paper was higher with organic manures than chemical fertilizers.

Mallangonuda *et al.* (1995) showed that when chilli-garlic companion cropping applied with NPK + FYM gave maximum yield and improved growth and yield of chilli.

Popescu *et al.* (1995) observed that the plants grown on organic substrate produced more than twice the yield of those grown in soil and harvesting was two week earlier in sweet papers.

Trepeski *et al.* (1995) used fertilizers like worm casts (10 t/ha), manures (40 t/ha), standard NPK and 27 per cent URAS or KAN and they concluded that the organic fertilizers were very expensive and the best economic results were obtained with mineral fertilizers, which increased the yield by 4554 kg/ha over the unfertilized control.

Warade *et al.* (1995) found that the highest onion bulb yield was obtained with FYM 40 t/ha + NPK 100 : 50 : 50 kg/ha as soil application.

Abou-El-Naga *et al.* (1996) concluded that availability of NPK, Mn and Zn increased with increasing application rather of both organic manures and irrigation water and resulted in maximum yield of green papper.

Fugro (1996) revealed that application of Vikas (7 : 10 : 5) 1.5 t/ha + 75 : 25 : 25 kg NPK/ha gave highest yield (166.23 q/ha) and increased keeping quality of chilli. Application of celerich 3 t/ha alone gave lowest yield (39.87 q/ha) over all treatments.

Balsubramanium *et al.* (1998) revealed that application of 100 per cent soil test based NPK combined with Zinc sulphate (50 kg/ha), Borax (10 kg/ha) and composted coir pith recorded highest tomato fruit yield than that of control.

✓ Malewar *et al.* (1998) stated that the application of 75 kg N/ha through FYM + 75 kg N/ha through urea was found beneficial in increasing yield and nutrient uptake of chilli.

✓ Raut (1998) concluded that per hectare application of 75 kg N + Biofertilizer + FYM was found to be superior for increasing the highest yield of okra.

✓ Shashidhara *et al.* (1998) worked on chilli and concluded that the application of 100 per cent RDF together with organic fertilizers like FYM, vermicompost, red gram stalk and biogas slurry increased dry yield of chilli significantly over 50 per cent and 0 per cent RDF.

✓ Umap (1998) investigated that the superdigested litter compost of Shivar @ 15 t/ha and Karanj @ 15 t/ha with 50 per cent recommended NPK/ha were found best treatments in increasing yield of chilli.

✓ Hu Shi You *et al.* (1999) observed that yield of capsicum were 273.6 g/plot in plant supplied with organic manures, 265 g/plot with inorganic fertilizers and 108.9 g/plot with no fertilizer application.

Shelke *et al.* (1999) indicated that substitution of 60 per cent urea N by poultry manure followed by substitution of 60 per cent urea by FYM were found increased yield of brinjal.

Sharma and Arya (2001) reported that application of FYM 20 t/ha and 20 kg N significantly increase the cabbage yield.

✓ Rafi *et al.* (2002) reported maximum yield (586.51 q/ha) in tomato with application of 50 per cent RDF + 50 per cent FYM.

## **2.4 Effect on quality**

### **2.4.1 Length of fruit, diameter of fruit, weight of individual fruit and number seeds per fruit**

Khan and Suryanarayana (1977) observed that the highest level of 120 kg/ha nitrogen with 45 kg/ha of each phosphorus and potassium resulted in maximum number of fruits per plant, maximum fruit size in terms of length and girth and highest yield of chilli per unit area.

Abusaleh (1982) studied the efficiency of N from inorganic as well as organic source on the seed quality of okra. The organic form in combination with inorganic form provide better in enhancing the seed weight, seed number, volume and germination of seed to obtain good quality seeds. Further he concluded that, combined application of organic and inorganic forms of nitrogen is necessary.

Almazov and Kholuyako (1990) revealed that NPK with peat increased dry matter and sugar contents in tomato fruits.

Hsieh Ching Fang *et al.* (1994) observed that the fruit number and fruit size were higher in sweet paper with organic manures than that of chemical fertilizers.

Fugro (1996) revealed that the plot applied with Vikas 1.5 t/ha + 75 : 25 : 25 kg NPK/ha gave the maximum number of fruits (324.13) per plant and higher fruit breadth (0.91 cm). In the plot applied with Neem cake 4 t/ha alone maximum fruit length (8.7 cm) was observed in chilli variety Konkan Kirti.

Raut (1998) observed that the number of flowers per plant were higher at plants receiving 75 kg N + Biofertilizer + FYM,

maximum breadth and length of okra fruit at plants receiving 75 kg N/ha + FYM were recorded.

Zang *et al.* (1998) reported that the combined use of N with P and K fertilizers or the nutrients supplied in a balanced manner with soybean meal resulted in production of better quality fruit in tomato.

✓ Barekar (2000) observed that maximum length and breadth of chilli fruits were found at plants supplied with 150 : 50 : 50 kg NPK/ha + 10 t FYM/ha in combination with PSB as biofertilizer.

✓ Dange (2001) observed that the maximum length of fruit (8.95 cm) maximum length of pedicel (2.70 cm), maximum breadth of fruit (0.743 cm) and higher number of seeds per fruit (70.66) of chilli were found at plants supplied with 50% RDF + 50% organic manure. (Celrich).

## **2.5 Economics of production**

Sharma (1995) application of 10 t compost + fermented cowdung @ 2 liter/sqm gave maximum monetary returns Rs. 28, 986 /- with a cost benefit ratio of 1 : 3.06 as compared to control and other treatments in okra.

Singh *et al.* (1997) obtained maximum net returns of Rs. 32,651/ha with application of FYM + 100 kg N + 25 kg P + 25 kg K/ha as against control or other treatment combination in *Rabi* onion.

Yadav *et al.* (2002) reported more cost benefit ratio (2.7) with application of NICAST 500 kg/ha + Recommended NPK (150 : 50 : 75 kg/ha) in cabbage.

Yadav and Yadav (2002) found maximum cost benefit ratio (2.79) with application of NICAST 750 kg/ha (organic manures ) + recommended dose of NPK (100 : 50 : 100 kg/ha) in onion.

*Material*  
*&*  
*Methods*



## CHAPTER III

# MATERIAL AND METHODS

The details of materials used and methods adopted during the course of present investigation are summarized in this chapter. The present investigation entitled "EFFECT OF ORGANIC AND INORGANIC FERTILIZERS ON GROWTH AND GREEN FRUIT YIELD OF CHILLI".

### 3.1 Experimental site

The field experiment was conducted on experimental field at Horticultural Research Station, Sub-campus, Marathwada Agricultural University, Parbhani (MS) during *Kharif* season of 2003-2004.

### 3.2 Agroclimatic condition

Parbhani is situated at 408.50 m above the mean sea level. Geographically it is situated between  $19^{\circ}16'$  N latitude and  $76^{\circ}47'$  E longitude and comes under tropical region of India.

The Parbhani area receives rainfall mainly from South-West monsoon commencing from second week of June to September.

The data on temperature, humidity and rainfall during entire crop growth were recorded at Meteorological Observatory, M.A.U., Parbhani (Appendix - I).

### 3.3 Soil

Soil of experimental plot was fairly uniform, medium black cotton type, well drained with uniform texture.

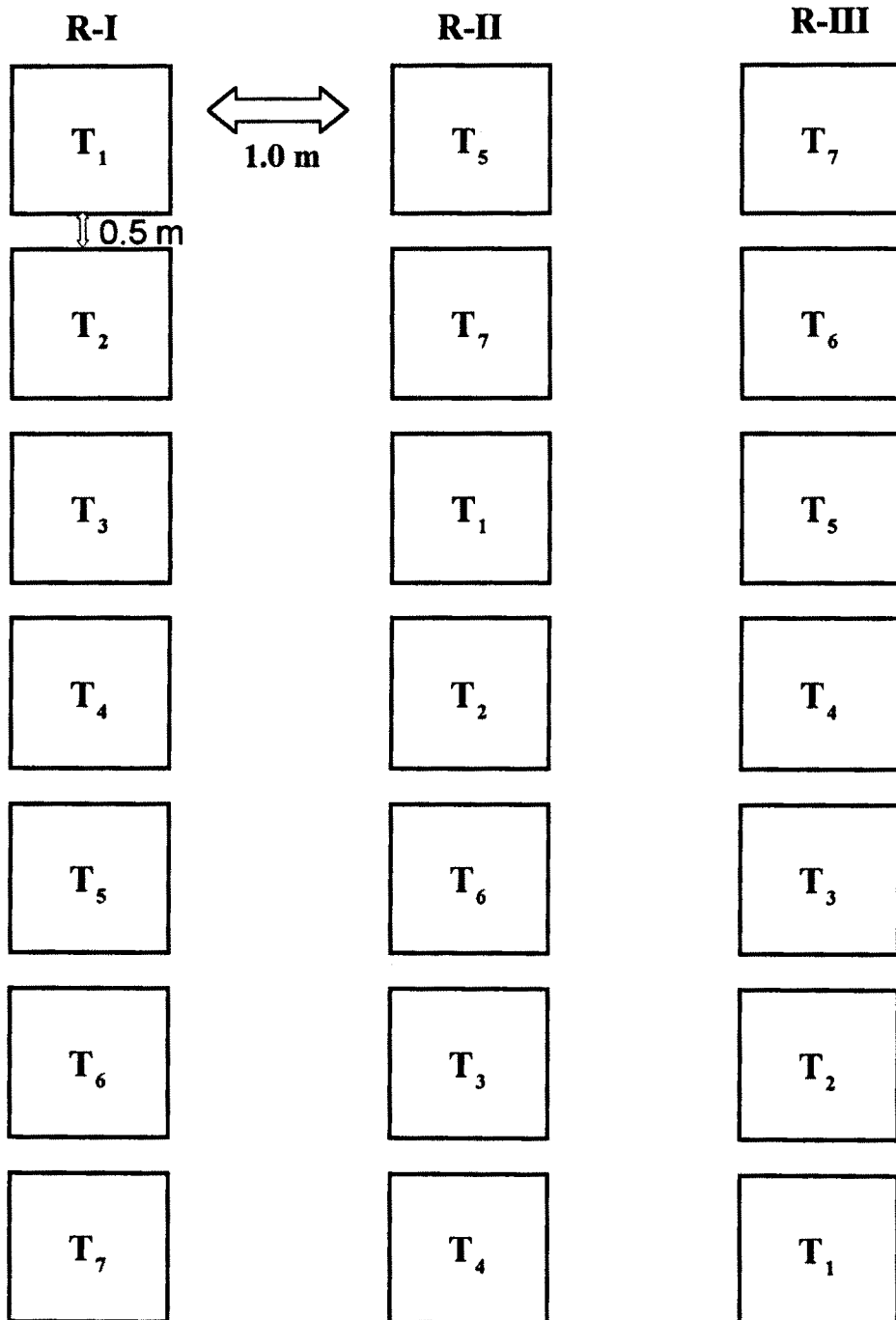
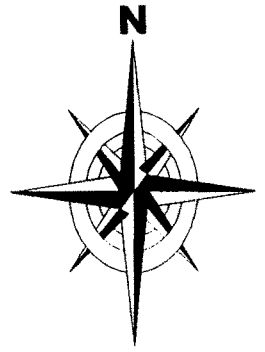
**Table-1 : Chemical properties of experimental soil**

Particulars	Estimate and unit
Organic carbon	0.60 %
Available nitrogen	246.06 kg/ha
Available phosphorus	19.11 kg/ha
Available potassium	326.74 kg/ha
Electric conductivity (EC)	0.34 nm hos/cm
pH	7.63

**3.4 Programme of Research work****3.4.1 Experimental details**

Experimental design	:	Randomized Block Design
Number of replications	:	Three
Number of treatments	:	Seven
Total number of plots	:	Twenty one
Plot size	:	Net – 3.00 m x 2.70m Gross – 3.60 m x 3.60 m
Spacing	:	Row to Row - 45 cm Plant to plant - 30 cm
Number of plants/plot:		96
Variety	:	Pusa Jwala

Pusa Jwala is an early cultivar which derived from a cross between NP 46 A x Puri Red. The plants are dwarf and spreading in habit. The fruits are long thin and usually curved.



**Fig. 1 : Plan of layout**

The dried fruits have shrunken skin which is not liked by traders and hence more suited as green chilli for export purpose (Muthukrishnan *et al.*, 1986).

### 3.4.2 Treatment details

Symbols	Treatments
T <sub>1</sub>	100 % RDF (Inorganic)
T <sub>2</sub>	100 % N through Vermicompost
T <sub>3</sub>	100 % N through Neem cake
T <sub>4</sub>	50 % RDF + 50 % N through Vermicompost
T <sub>5</sub>	50 % RDF + 50 % N through Neem cake
T <sub>6</sub>	50 % RDF + 25 % N through Neem cake + 25% N through Vermicompost
T <sub>7</sub>	Control

100 % RDF : Recommended dose of fertilizer 120 : 80 : 50  
kg NPK/ha

Neem cake : 2 t/ha

Vermicompost : 6 t/ha

### 3.5 Raising seeding

Seeds of Pusa Jwala were sown on raised beds of 3.0 x 1.0 x 0.15 m<sup>3</sup> (L x B x H) size and seedling were prepared. The upper layer of sum of each bed was mixed with equal quantity of well rotten FYM and sieved soil. Seeds of Pusa Jwala were sown in rows of 10 cm apart on 10 July, 2003 considering seed rate 1 kg/ha. Watering was done regularly by rose can. Raised beds were kept clean by weeding regularly. The seedlings were kept healthy by taking two sprays of Bavistin + Nuvacron of 15 days interval.

### **3.6 Preparatory tillage :**

Area of experiment was ploughed deeply and was harrowed thrice to bring the soil fine tilth. The field was divided into plots as per required dimensions by using the measuring tape, rope and pegs, the flat beds of 3.6 x 3.6 m<sup>2</sup> were prepared by leaving 1m gap between two plots.

### **3.7 Application of organic and inorganic fertilizer**

#### **3.7.1 Organic manures**

Organic manures neem cake and vermicompost were applied at 100 per cent to the plots of given treatment before 10 days of transplanting and light irrigation was given. The neem cake contain 5 per cent of N besides P, K and other nutrients. Where as vermicompost contain 0.6 per cent of N besides P, K and other nutrients.

#### **a) Vermicompost :**

It was decomposed mixture of organic material and cow dung which is earthworm. It contents 0.6 : 0.3 : 0.5 per cent NPK and applied 100 per cent, 50 per cent and 25 per cent to the particular plots before 10 days of transplanting and irrigation was given.

#### **b) Neem cake :**

Neem cake is the by product obtained after expelling oil from neem seeds. It contain 5 : 1 : 1.5 per cent of NPK. It also applied 100 per cent, 50 per cent and 25 per cent to the particular plots before 10 days of transplanting and irrigation was given.

### **3.7.2 Inorganic fertilizer**

The recommended dose of N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O were applied through urea, single super phosphate and murate of potash, respectively. Half dose of N and full dose of P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O were applied at the time of transplanting. Remaining half dose of N was applied 30 days after transplanting. Irrigation was immediately given after application of fertilizers.

### **3.8 Transplanting**

30 days old uniform healthy seedlings of one month age were selected and transplanted on flat beds on 14 August, 2003. Before transplanting irrigation was given and seedlings were transplanted at 45 x 30 cm and light irrigation was given till the seedlings were established, gap filling was done with healthy seedlings wherever required.

### **3.9 Other operations**

The experimental plot was kept weed free and regular irrigation and plant protection measures were followed the sprays of bavistin fungicide and monocrotophos insecticides were given for the main crop also.

### **3.10 Schedule of operations**

<i>Particulars</i>	<i>Dates</i>
1) Seed sowing on nursery bed	10 July, 2003
2) Transplanting	14 August, 2003
3) Harvesting (picking of fruits)	
a) First picking	3 November, 2003
b) Second picking	13 November, 2003
c) Third picking	24 November, 2003
d) Fourth picking	04 December, 2003
e) Fifth picking	15 December, 2003

### **3.1.1 Biometric observation**

Five plants were selected from each plot as observational plant and were labeled. The observation in respect to growth, yield and quality parameter was recorded.

#### **3.1.1.1 Plant height :**

Height of observational plants was measured in cm from ground level upto growing point. Initial plant height was recorded after 5-8 days after transplanting, then after 30, 60, 90 and 120 days of transplanting the plant height was noted.

#### **3.1.1.2 Primary branches :**

Number of primary branches per plant were recorded by taking actual count from the observational plants at 30, 60, 90 and 120 days after transplanting.

#### **3.1.1.3 Secondary branches :**

Number of secondary branches per plant were recorded by taking actual count from the observational plants at 30, 60, 90 and 120 days after transplanting.

#### **3.1.1.4 Spread of plant :**

Spread of observational plants of each plot was measured in cm from North-South and East-West direction. Then spread of plants recorded at 30, 60, 90 and 120 days after transplanting.

#### **3.1.1.5 Number of leaves per plant :**

Number of leaves per plant was recorded by taking actual count from the observational plants initially after 5-8 days transplanting. Then number of laves per plants were recorded at 30, 60, 90 and 120 days after transplanting

### **3.11.6 Days of flower initiation :**

Time taken from transplanting to initiation of first flower in a plot was considered as day of flower initiation. Plants were considered as days to flower initiation. Plants were observed daily and date of flower initiation was recorded.

### **3.11.7 Days to 50 per cent flowering :**

Dates to 50 per cent flowering in each treatments were recorded and from these dates days required for 50 per cent flowering were obtained.

### **3.11.8 Number of days required from fruit set to harvesting**

Days of fruit set in each treatments were recorded and from these dates, days required for fruit set to harvesting is also recorded. Thus, days required from fruit set to harvesting were obtained.

### **3.11.9 Number of fruits per plant :**

Number of fruits produced on observational plants were recorded by actual count at each picking.

### **3.11.10 Weight of fruits :**

Harvestable mature fruits were picked from the observational plants the weight of fruits per plant as well as per plot were recorded. The observations were noted picking wise.

### **3.11.11 Length of fruit (cm) :**

Five fruits were randomly collected after each picking from observational plants of each plot and length of fruits in cm (excluding pedicel) were recorded by using scale.

### **3.11.12 Diameter of fruit (cm) :**

Five fruits were randomly collected after each picking from observational plants of each plot and by inserting the pin in the fruit and using scale diameter of fruit in cm was recorded.

### **3.11.13 Number of seeds per fruit :**

Five fruits were randomly collected picking wise from observational plants and number of seeds per fruit were counted.

### **3.11.14 Weight of individual fruits :**

The weight of the individual fruits was recorded on the basis of 100 fruits weight.

### **3.11.15 Total yield per hectare :**

Sum of average marketable yield per hectare and average unmarketable yield per hectare in each treatment were taken for calculating the total yield per hectare in quintals.

### **3.12 Statistical analysis :**

The statistical analysis of data collected was done by following standard procedure described by Panse and Sukhatme (1967). The analysis of variance was carried out according to simple Randomized Block Design.

### **3.13 Economics :**

The economics of different treatments was worked out in order to compare the efficiency of treatments and the cost benefit ration was worked out from the gross returns and cost of cultivation according to variable cost only.



*Results*

## CHAPTER IV

# RESULTS

The present investigation was carried out to study the "EFFECT OF ORGANIC AND INORGANIC FERTILIZERS ON GROWTH AND GREEN FRUIT YIELD OF CHILLI". The experimental field was undertaken at Horticulture Research Station (Vegetable crops), Marathwada Agricultural University, Parbhani during *Kharif* season of 2003-04. The observation recorded in the respect of vegetative growth, reproductive growth and yield. The results obtained are presented in this chapter.

### 4.1 Growth parameter

The results obtained in respect of growth parameters viz. height, number of primary branches, number of secondary branches, spread of plant and number of leaves per plant (at 30, 60, 90 and 120 days after transplanting) has been presented as given below.

#### 4.1.1 Height of plant

The data presented in Table-2 in respect of height of plant as affected by different treatments clearly indicated that the inorganic fertilizers along with organic manures influenced the height of plant, recorded at 30, 60, 90 and 120 days after transplanting.

At 30 days after transplanting, the significantly more height of plant was found in treatment T<sub>5</sub> - 50 % RDF + 50 % N through Neem cake (23.53 cm) which was at par with treatment T<sub>1</sub>- 100 % RDF (22.93 cm). The treatments T<sub>6</sub>, T<sub>4</sub>, T<sub>3</sub> and T<sub>2</sub>

were at par with each other. Whereas, height of plant was smallest in treatment T<sub>7</sub> - control (15.50 cm).

At 60 days after transplanting the significantly more plant height (35.80 cm) was recorded in treatment T<sub>5</sub> - 50 % RDF + 50 % N through Neem cake followed by T<sub>1</sub> - 100 % RDF (31.60 cm) which was at par with treatment T<sub>6</sub> (31.00 cm). The treatments T<sub>4</sub>, T<sub>3</sub> and T<sub>2</sub> were at par with each other. Minimum plant height (24.46 cm) was recorded in treatment T<sub>7</sub> - control.

**Table 2: Height of plant as affected by different treatments (cm)**

Treatments	Days After Transplanting			
	30	60	90	120
T <sub>1</sub> - 100 % RDF (Inorganic)	22.93	31.60	42.26	46.20
T <sub>2</sub> - 100 % N through Vermicompost	17.66	28.20	36.66	42.26
T <sub>3</sub> - 100 % N through Neem cake	18.13	28.46	38.00	43.06
T <sub>4</sub> - 50 % RDF + 50 % N through Vermicompost	18.46	28.53	35.80	41.26
T <sub>5</sub> - 50 % RDF + 50 % N through Neem cake	23.53	35.80	44.33	51.60
T <sub>6</sub> - 50 % RDF + 25 % N through Neem cake + 25 % N through vermicompost	19.40	31.00	39.53	43.40
T <sub>7</sub> - Control	15.50	24.46	29.20	36.23
SE ±	0.63	0.69	0.93	0.76
C.D. at 5%	1.92	2.08	2.88	2.32

At 90 days after transplanting, the maximum plant height was recorded in treatment T<sub>5</sub> - 50 % RDF + 50 % N through Neem cake (44.33 cm) and which was found to be statistically at par with treatment T<sub>1</sub> - 100 % RDF (42.26 cm). Treatment T<sub>6</sub> (39.53 cm), T<sub>3</sub> (38.00 cm) and T<sub>2</sub> (36.66 cm) were found to be at par with each other. Among all treatments less plant height was observed in treatment T<sub>7</sub> - control (29.20 cm).

At 120 days after transplanting, it was observed that Treatment T<sub>5</sub> - 50 % RDF + 50 % N through Neem cake recorded significantly more plant height (51.60 cm) over all the remaining treatments followed by the treatment T<sub>1</sub> - 100% RDF (46.20 cm).

The treatments T<sub>6</sub>, T<sub>3</sub>, T<sub>2</sub> and T<sub>4</sub> were found to be statistically at par with each other and significant over control. Whereas, treatment T<sub>7</sub> - control recorded minimum plant height (36.23 cm) among all treatments.

#### **4.1.2 Number of primary branches per plant**

It was observed from Table-3 that the application of organic, inorganic fertilizer and their combinations influenced the number of primary branches per plant at various period of observation that is at 30, 60, 90 and 120 days after transplanting.

At 30 days after transplanting, significantly more number of primary branches per plant were found in treatment T<sub>5</sub> - 50 % RDF + 50 % N through Neem cake (7.40) and superior over all treatments, followed by treatment T<sub>6</sub> - 50 % RDF + 25 % Neem cake + 25 % Vermicompost (6.73). The treatments T<sub>4</sub> (6.33), T<sub>2</sub> (6.26) and T<sub>1</sub> (6.13) were at par with each other and recorded significantly more number of primary branches per

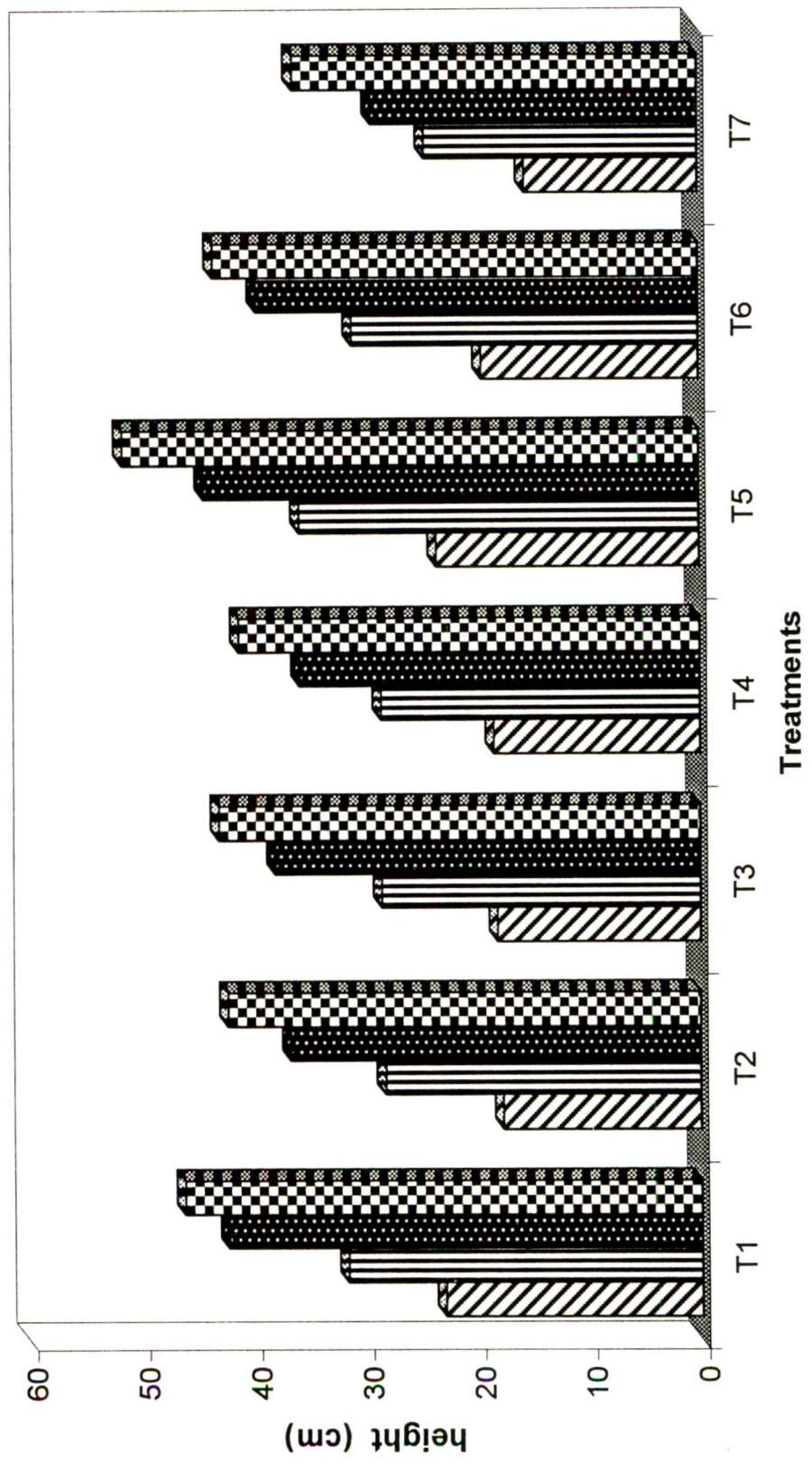


Fig. 2 : Height (cm) of plant as affected by different treatments



Fig. 3 : Number of primary branches as affected by different treatments

plant over treatment T<sub>3</sub> and T<sub>7</sub> which was at par with each other. Whereas, minimum number of primary branches were found in treatment T<sub>7</sub> – control (5.60).

**Table 3: Number of primary branches per plant as affected by different treatments**

Treatments	Days After Transplanting			
	30	60	90	120
T <sub>1</sub> – 100 % RDF (Inorganic)	6.13	7.10	7.60	7.80
T <sub>2</sub> – 100 % N through Vermicompost	6.26	6.66	7.16	7.40
T <sub>3</sub> – 100 % N through Neem cake	5.90	6.26	6.80	7.01
T <sub>4</sub> – 50 % RDF + 50 % N through Vermicompost	6.33	7.40	8.13	8.33
T <sub>5</sub> – 50 % RDF + 50 % N through Neem cake	7.40	8.10	8.53	8.85
T <sub>6</sub> – 50 % RDF + 25 % N through Neem cake + 25 % N through vermicompost	6.73	7.60	8.31	8.50
T <sub>7</sub> – Control	5.60	5.93	6.40	6.78
SE ±	0.11	0.06	0.07	0.07
C.D. at 5%	0.34	0.21	0.23	0.21

At 60 days after transplanting, the significantly more number of primary branches were recorded in treatment T<sub>5</sub> – 50 % RDF + 50 % N through Neem cake (8.10) which was found to be superior over all treatments, followed by treatment T<sub>6</sub> – 50 % RDF + 25 % Neem cake + 25 % Vermicompost (7.60), which

was at par with treatment T<sub>4</sub> (7.40). The minimum number of primary branches were found in control treatment (5.93).

At 90 days after transplanting significantly more number of primary branches were observed in treatment T<sub>5</sub> - 50 % RDF + 50 % N through Neem cake (8.53) which was significantly superior over all treatments except treatment T<sub>6</sub> - 50 % RDF + 25 % Neem cake + 25 % Vermicompost (8.31), which was similar to T<sub>5</sub>. However, least number of primary branches were recorded in control treatment (6.40).

At final observation similar trend was observed that is treatment T<sub>5</sub> - 50 % RDF + 50 % N through Neem cake (8.85) emerged significantly superior over all other treatments followed by T<sub>6</sub> - 50 % RDF + 25 % Neem cake + 25 % Vermicompost (8.50) which was at par with treatment T<sub>4</sub> (8.33). The minimum number of primary branches were observed in treatment T<sub>7</sub> (6.78) as a control.

#### **4.1.3 Number of secondary branches**

It was observed from Table-4 that the application of organic, inorganic fertilizer and their combinations influenced the number of secondary branches per plant at various period of observation that is at 30, 60, 90 and 120 days after transplanting.

At 30 days after transplanting the significantly maximum number of secondary branches per plant were recorded in treatment T<sub>5</sub> - 50 % RDF + 50 % N through Neem cake (16.06) which was significantly superior over all the remaining treatments. The next superior treatment was T<sub>6</sub> - 50 % RDF + 25 % Neem cake + 25 % Vermicompost (14.80), which was statistically at par with T<sub>4</sub> and T<sub>2</sub> but these treatments were

significantly superior over T<sub>1</sub>, T<sub>3</sub> and T<sub>7</sub>. The treatment T<sub>1</sub>, T<sub>3</sub> and T<sub>7</sub> were statistically at par with each other where as lowest number of secondary branches were observed in control treatment (11.73).

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**Table 4: Number of secondary branches per plant as affected by different treatments**

Treatments	Days After Transplanting			
	30	60	90	120
T <sub>1</sub> - 100 % RDF (Inorganic)	12.73	16.46	19.73	21.40
T <sub>2</sub> - 100 % N through Vermicompost	14.06	16.40	18.26	19.66
T <sub>3</sub> - 100 % N through Neem cake	12.66	16.20	18.66	19.33
T <sub>4</sub> - 50 % RDF + 50 % N through Vermicompost	14.60	17.73	20.53	21.13
T <sub>5</sub> - 50 % RDF + 50 % N through Neem cake	16.06	19.40	23.06	24.73
T <sub>6</sub> - 50 % RDF + 25 % N through Neem cake + 25 % N through vermicompost	14.80	18.53	20.40	21.53
T <sub>7</sub> - Control	11.73	15.86	17.46	18.53
SE ±	0.38	0.21	0.27	0.46
C.D. at 5%	1.16	0.66	0.84	1.40

At 60 days after transplanting, the significantly more number of secondary branches per plant were observed in treatment T<sub>5</sub> - 50 % RDF + 50 % N through Neem cake (19.40), followed by treatment T<sub>6</sub> - 50 % RDF + 25 % Neem cake + 25 %



Vermicompost (18.53). The treatments T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> and T<sub>7</sub> were at par with each other. However, minimum number of secondary branches were observed in control treatment (15.86).

At 90 days after transplanting, significantly more number of secondary branches per plant (23.06) were recorded in treatment T<sub>5</sub> - 50 % RDF + 50 % N through Neem cake which was significantly superior over all treatments. The next superior treatment was T<sub>4</sub> - 50 % RDF + 50 % Vermicompost (20.53). The treatments T<sub>4</sub>, T<sub>6</sub> and T<sub>1</sub> were at par with each other. The less number of secondary branches (17.46) were observed in control treatment T<sub>7</sub>.

At 120 days after transplanting, the significantly more number of secondary branches were recorded in treatment T<sub>5</sub> - 50 % RDF + 50 % N through Neem cake (24.73), followed by T<sub>6</sub> - 50 % RDF + 25 % Neem cake + 25 % Vermicompost (21.53). The treatments T<sub>6</sub>, T<sub>1</sub> and T<sub>4</sub> were significantly at par with each other and significantly superior over T<sub>2</sub>, T<sub>3</sub> and T<sub>7</sub> which was at par with each other. Whereas, minimum number of secondary branches were recorded in treatment T<sub>7</sub>-control (18.53).

#### **4.1.4 Spread of plant (cm)**

The data presented in Table-5 in respect of spread of plant as influenced by different treatments clearly indicated that the organic manures along with inorganic fertilizers influences the spread of plant recorded at 30, 60, 90 and 120 days after transplanting.

At 30 days after transplanting, the spread of plant was significantly more in treatment T<sub>5</sub> - 50 % RDF + 50 % N through Neem cake (19.06 cm) over all the treatment followed by treatment T<sub>6</sub> - 50 % RDF + 25 % Neem cake + 25 %

Vermicompost where spread of plant was 16.96 cm. However, treatments T<sub>6</sub>, T<sub>1</sub> and T<sub>4</sub> were at par with each other and significantly more spread than T<sub>3</sub>, T<sub>2</sub> and T<sub>7</sub> which was at par with each other whereas minimum spread of plant was recorded in treatment T<sub>7</sub> – control (15.13 cm).

**Table-5: Spread of a plant as affected by different treatments (cm)**

Treatments	Days After Transplanting			
	30	60	90	120
T <sub>1</sub> – 100 % RDF (Inorganic)	16.86	20.86	26.60	27.93
T <sub>2</sub> – 100 % N through Vermicompost	15.53	20.66	25.66	27.33
T <sub>3</sub> – 100 % N through Neem cake	15.66	22.26	26.33	27.33
T <sub>4</sub> – 50 % RDF + 50 % N through Vermicompost	16.73	21.93	26.46	28.93
T <sub>5</sub> – 50 % RDF + 50 % N through Neem cake	19.06	26.26	29.53	31.46
T <sub>6</sub> – 50 % RDF + 25 % N through Neem cake + 25 % N through vermicompost	16.96	22.66	27.26	28.66
T <sub>7</sub> – Control	15.13	19.60	23.73	25.53
SE $\pm$	0.37	0.36	0.44	0.52
C.D. at 5%	1.15	1.11	1.35	1.58

At 60 days after transplanting, the spread of plant was significantly more in treatment T<sub>5</sub> – 50 % RDF + 50 % N through Neem cake (26.26 cm), followed by the treatment T<sub>6</sub> –

50 % RDF + 25 % Neem cake + 25 % Vermicompost (22.66 cm). The treatments T<sub>6</sub>, T<sub>3</sub> and T<sub>4</sub> were at par with each other. Whereas, the minimum spread of plant was recorded in treatment T<sub>7</sub> –control (19.60 cm).

At 90 days after transplanting, maximum spread of plant was observed in treatment T<sub>5</sub> - 50 % RDF + 50 % N through Neem cake (29.53 cm) which was significantly superior over all treatments. The treatment T<sub>6</sub> - 50 % RDF + 25 % Neem cake + 25 % Vermicompost (27.26 cm), T<sub>1</sub> (26.60 cm), T<sub>4</sub> (26.46 cm) and T<sub>3</sub> (26.33 cm) were at par with each other. The minimum spread of plant observed in control treatment T<sub>7</sub> (23.73 cm).

At 120 days after transplanting, the spread of plant significantly more in treatment T<sub>5</sub> - 50 % RDF + 50 % N through Neem cake (31.46 cm), followed by T<sub>4</sub> (28.93 cm), T<sub>6</sub> (28.66 cm) and T<sub>1</sub> (27.93 cm) which were at par with each other. The treatment T<sub>7</sub> – control showed minimum spread of plant (25.53 cm) as compared to other treatments.

#### **4.1.5 Number of leaves per plant**

It was observed from Table-6 that, the application of organic, inorganic manuring and their combinations influenced the leaves per plant at various period of intervals that is at 30, 60, 90 and 120 days after transplanting.

At 30 days after transplanting, significantly more number of leaves per plant were recorded in treatment T<sub>5</sub> - 50 % RDF + 50 % N through Neem cake (240.83), followed by treatment T<sub>6</sub> - 50 % RDF + 25 % Neem cake + 25 % Vermicompost (202.83) The number of leaves per plant were significantly less in control treatment T<sub>7</sub> (145.83) than that of all remaining treatments.

**Table-6: Number of leaves per plant as affected by different treatments**

Treatments	Days After Transplanting			
	30	60	90	120
T <sub>1</sub> - 100 % RDF (Inorganic)	194.17	243.33	283.33	294.83
T <sub>2</sub> - 100 % N through Vermicompost	158.90	211.00	263.33	289.83
T <sub>3</sub> - 100 % N through Neem cake	182.67	222.83	256.83	270.67
T <sub>4</sub> - 50 % RDF + 50 % N through Vermicompost	188.17	214.83	275.67	311.67
T <sub>5</sub> - 50 % RDF + 50 % N through Neem cake	240.83	306.67	329.50	343.50
T <sub>6</sub> - 50 % RDF + 25 % N through Neem cake + 25 % N through vermicompost	202.83	225.67	296.83	318.50
T <sub>7</sub> - Control	145.83	190.00	215.17	222.17
SE $\pm$	1.81	2.69	3.10	4.21
C.D. at 5%	5.47	8.16	9.43	12.97

At 60 days after transplanting, the data in respect of mean number of leaves showed that combinations of 50 % RDF + 50 % N through Neem cake resulted in significantly maximum number of number of leaves per plant (306 .67) followed by treatment T<sub>1</sub> - 100 per cent RDF (243.33). The treatments T<sub>6</sub> (225.67), T<sub>3</sub> (222.83) and T<sub>4</sub> (214.83) were at par with each

other and significantly superior over control. The treatment T<sub>7</sub> control recorded significantly minimum number of leaves (190.00) per plant.

At 90 days after transplanting, the significantly more number of leaves (329.50) were recorded in treatment T<sub>5</sub> - 50 % RDF + 50 % N through Neem cake than that of remaining all other treatments. The next superior treatment was T<sub>6</sub> - 50 % RDF + 25 % Neem cake + 25 % Vermicompost (296.83). The treatments T<sub>1</sub> (283.33) and T<sub>4</sub> (275.67) were at par with each other and recorded significantly more number of leaves per plant over control. Whereas, control treatment showed only 215.17 leaves per plant.

It was clear from the last observation taken at 120 days after transplanting that treatment T<sub>5</sub> - 50 % RDF + 50 % N through Neem cake, emerged as significantly superior over all treatments in respect of leaves per plant.

Amongst the treatments T<sub>5</sub> recorded significantly more number of leaves per plant (343.50), followed by treatment T<sub>6</sub> (318.50) which was at par with T<sub>4</sub> (311.67). The treatment T<sub>7</sub> - control recorded significantly less (222.17) number of leaves per plant than other treatments.

## **4.2 Reproductive parameters**

### **4.2.1 Days to flower initiation and 50 per cent flowering**

The data presented in Table - 7 in respect of days to flower initiation and 50 per cent flowering as affected by organic, inorganic manuring and their combinations by different treatments.

**Table-7: Days to flower initiation and 50 per cent flowering as affected by different treatments**

Treatments	Days After Transplanting	
	Flower initiation	50 % flowering
T <sub>1</sub> - 100 % RDF (Inorganic)	38.80	42.73
T <sub>2</sub> - 100 % N through Vermicompost	39.66	44.00
T <sub>3</sub> - 100 % N through Neem cake	39.13	43.13
T <sub>4</sub> - 50 % RDF + 50 % N through Vermicompost	38.73	42.73
T <sub>5</sub> - 50 % RDF + 50 % N through Neem cake	34.46	38.46
T <sub>6</sub> - 50 % RDF + 25 % N through Neem cake + 25 % N through vermicompost	38.20	42.20
T <sub>7</sub> - Control	41.66	45.73
SE ±	0.44	0.50
C.D. at 5%	1.33	1.53

The data revealed that there was significant effect of various treatments on flower initiation period the treatment T<sub>5</sub> - 50 % RDF + 50 % N through Neem cake produce significantly earlier flower initiation than all other treatments. The treatments T<sub>6</sub>, T<sub>4</sub>, T<sub>1</sub> and T<sub>3</sub> were found to be statistically at par with each other. However, these treatments induced significantly earlier flower initiation than that of control.

The treatment T<sub>5</sub> showed earliness flowering which took minimum number of days for appearance of first flower (34.66 DAT), followed by treatment T<sub>6</sub> (38.20 DAT). The treatment T<sub>7</sub> – control recorded late initiation of flowering (41.66 DAT) as compared to other treatments.

#### **Days required for 50 per cent flowering**

The data in Table-7 also clearly showed that, the treatments in which flowering was initiated earlier also had earlier 50 per cent flowering. The treatment T<sub>5</sub> - 50 % RDF + 50 % N through Neem cake resulted earlier 50 per cent flowering (38.46 DAT) followed by treatment T<sub>6</sub> - 50 % RDF + 25 % Neem cake + 25 % Vermicompost (42.20 DAT). However, the treatments T<sub>6</sub>, T<sub>1</sub>, T<sub>4</sub> and T<sub>3</sub> were at par with each other and recorded earlier 50 per cent flowering than that of control. Whereas, number of days required for 50 per cent flowering was found to be significantly more in the treatment T<sub>7</sub> – control (45.73 DAT) than all other treatments.

#### **4.2.2 Fruit set percentage and days required from fruit set to harvest**

Data recorded in respect of days required from fruit set to harvest and per cent fruit set was influenced by organic, inorganic manuring and their combinations by different treatments are presented in Table-8. All treatments showed significantly more percentage of fruit set than that of control.

Data indicated that the treatment T<sub>5</sub> - 50 % RDF + 50 % N through Neem cake recorded significantly more fruit set that is 59.66 per cent than all other treatments. The next superior treatment was T<sub>6</sub> (57.13 per cent) in this respect. The treatment T<sub>2</sub> (46.46) and T<sub>3</sub> (46.13) were at par with each other. Whereas

lowest fruit set was observed in treatment T<sub>7</sub> – control (43.06 per cent).

**Table-8 : Per cent of fruit set and days to fruit set to harvesting as affected by different treatments**

<b>Treatments</b>	<b>Per cent fruit Set</b>	<b>Days required from fruit set to harvest</b>
T <sub>1</sub> – 100 % RDF (Inorganic)	51.86	10.06
T <sub>2</sub> – 100 % N through Vermicompost	46.46	11.13
T <sub>3</sub> – 100 % N through Neem cake	46.13	10.86
T <sub>4</sub> – 50 % RDF + 50 % N through Vermicompost	54.93	9.86
T <sub>5</sub> – 50 % RDF + 50 % N through Neem cake	59.66	7.93
T <sub>6</sub> – 50 % RDF + 25 % N through Neem cake + 25 % N through vermicompost	57.13	8.06
T <sub>7</sub> – Control	43.06	12.60
SE ±	0.56	0.45
C.D. at 5%	1.70	1.39

The data presented in Table-8 also revealed that the treatment T<sub>5</sub> - 50 % RDF + 50 % N through Neem cake resulted

early picking and required 7.93 days from fruit set to harvest. The treatment T<sub>5</sub> was at par with T<sub>6</sub> - 50 % RDF + 25 % Neem cake + 25 % vermicompost (8.06 days). However, the maximum days required from fruit set to harvest was observed in control treatment T<sub>7</sub> (12.60 days).

### **4.3. Yield**

#### **4.3.1 Total number of fruits and weight of fruit per plant**

The data presented in Table-9 in respect of fruit per plant clearly revealed that total number of fruits per plant were significantly more in treatment T<sub>5</sub> - 50 % RDF + 50 % N through Neem cake (136.66), followed by treatment T<sub>6</sub> - 50 % RDF + 25 % Neem cake + 25 % vermicompost (121.00). The treatments T<sub>3</sub>, T<sub>1</sub> and T<sub>4</sub> were at par with each other and significantly more fruits per plant over control. Whereas, less number of fruits were recorded in treatment T<sub>7</sub> as a control (83.00).

The data presented in Table-9 also showed that the maximum weight of fruits per plant was recorded in treatment T<sub>5</sub> - 50 % RDF + 50 % N through Neem cake (331.72 g) which was significantly superior over all treatments. The next superior treatment was T<sub>6</sub> - 50 % RDF + 25 % Neem cake + 25 % vermicompost (272.20 g). The treatments T<sub>6</sub>, T<sub>4</sub> and T<sub>3</sub> were at par with each other and recorded more weight of fruits per plant than that of control. However, the treatment T<sub>7</sub> - control recorded significantly less weight of fruit per plant (223.73 g).

**Table-9 : Total number of fruits and weight of fruits per plant as affected by different treatments**

<b>Treatments</b>	<b>Number Of Fruits Per Plants</b>	<b>Weight Of Fruits Per Plant (gm)</b>
T <sub>1</sub> - 100 % RDF (Inorganic)	111.00	248.00
T <sub>2</sub> - 100 % N through Vermicompost	102.33	256.13
T <sub>3</sub> - 100 % N through Neem cake	113.66	262.72
T <sub>4</sub> - 50 % RDF + 50 % N through Vermicompost	108.33	264.46
T <sub>5</sub> - 50 % RDF + 50 % N through Neem cake	136.66	331.72
T <sub>6</sub> - 50 % RDF + 25 % N through Neem cake + 25 % N through vermicompost	121.00	272.20
T <sub>7</sub> - Control	83.00	223.73
SE $\pm$	3.34	3.57
C.D. at 5%	10.21	10.99

#### **4.3.2 Yield of crop**

From the Table-10 it was observed that application of organic, inorganic manuring and their combinations influenced the yield of Pusa Jawla chilli significantly.

Data in Table-10 indicted that all treatments of organic and inorganic fertilizers individually or in combination significantly produced more yield than that of control. Similarly, it was also found that treatment T<sub>5</sub> - 50 % RDF + 50 % N

through Neem cake gave significantly more yield (109.26 q/ha) than all other treatments. The next superior treatment was T<sub>6</sub> - 50 % RDF + 25 % Neem cake + 25 % vermicompost where yield was 89.75 q/ha. The treatments T<sub>2</sub>, T<sub>1</sub>, T<sub>3</sub> and T<sub>4</sub> were at par with each other in respect of yield. The lowest yield (72.84 q/ha) was recorded under control.

✓ **Table-10: Total green fruit yield of chilli in different treatments**

<b>Treatments</b>	<b>Yield Per Hectare (Q)</b>
T <sub>1</sub> - 100 % RDF (Inorganic)	85.06
T <sub>2</sub> - 100 % N through Vermicompost	84.32
T <sub>3</sub> - 100 % N through Neem cake	86.54
T <sub>4</sub> - 50 % RDF + 50 % N through Vermicompost	86.91
T <sub>5</sub> - 50 % RDF + 50 % N through Neem cake	109.26
T <sub>6</sub> - 50 % RDF + 25 % N through Neem cake + 25 % N through vermicompost	89.75
T <sub>7</sub> - Control	72.84
SE ±	1.11
C.D. at 5%	3.43

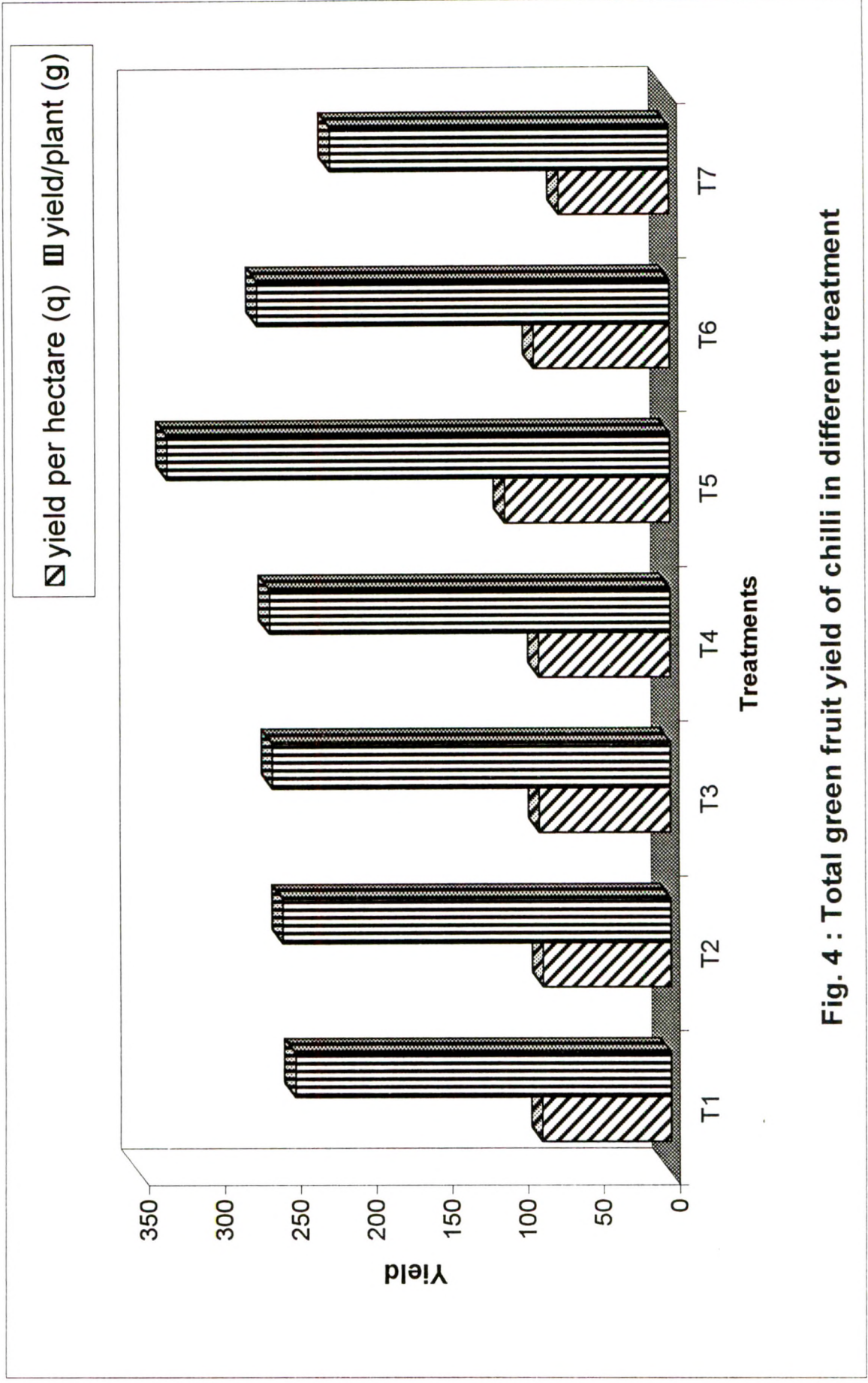


Fig. 4 : Total green fruit yield of chilli in different treatment

## **4.4 Quality parameters**

### **4.4.1 Weight of individual fruit and number of seeds per fruit**

The data depicted in Table-11 clearly revealed that the significantly more individual weight of fruit was recorded in treatment T<sub>5</sub> - 50 % RDF + 50 % N through Neem cake (2.63 g) which was significantly superior over all treatment. The next superior treatment was treatment T<sub>6</sub> - 50 % RDF + 25 % Neem cake + 25 % vermicompost (2.57 g). The treatments T<sub>6</sub>, T<sub>4</sub> and T<sub>1</sub> were at par with each other and significantly more individual fruit weight was recorded than that of T<sub>3</sub>, T<sub>2</sub> and T<sub>7</sub> treatment. However, treatments T<sub>2</sub> and T<sub>7</sub> were at par with each other and lowest weight of individual fruit was recorded in control (2.36 g).

### **Number of seeds per fruit**

The data pertaining in Table-11 also indicated that the mean number of seeds per fruits were significantly more (29.93) in treatment T<sub>5</sub> - 50 % RDF + 50 % N through Neem cake than treatment T<sub>1</sub>, T<sub>3</sub>, T<sub>2</sub>, T<sub>4</sub> and T<sub>7</sub>. The treatment T<sub>5</sub> was statistically at par with treatment T<sub>6</sub> (27.33).

The treatments T<sub>1</sub>, T<sub>3</sub>, T<sub>2</sub>, T<sub>4</sub> and T<sub>7</sub> were at par with each other. Whereas, the lowest number of seeds per fruit (17.13) was recorded in control.

**Table-11 : Weight of individual fruits and number of seeds per fruit as affected by different treatments**

<b>Treatments</b>	<b>Weight Of Individual Fruits(Gm)</b>	<b>Number Of Seeds Per Fruit</b>
T <sub>1</sub> - 100 % RDF (Inorganic)	2.51	21.46
T <sub>2</sub> - 100 % N through Vermicompost	2.40	19.53
T <sub>3</sub> - 100 % N through Neem cake	2.47	20.06
T <sub>4</sub> - 50 % RDF + 50 % N through Vermicompost	2.56	18.00
T <sub>5</sub> - 50 % RDF + 50 % N through Neem cake	2.63	29.93
T <sub>6</sub> - 50 % RDF + 25 % N through Neem cake + 25 % N through vermicompost	2.57	27.33
T <sub>7</sub> - Control	2.36	17.13
SE $\pm$	0.018	1.54
C.D. at 5%	0.056	4.75

#### **4.4.2 Length and diameter of fruit**

The data presented in Table-12 in respect of length of fruit and diameter of fruit. The data clearly indicated that the length of fruit was recorded in all treatments should significantly more than that of control.

Under T<sub>5</sub> - 50 % RDF + 50 % N through Neem cake (9.50 cm) and T<sub>6</sub> - 50 % RDF + 25 % Neem cake + 25 % vermicompost (8.10 cm) treatments fruit length was significantly more than rest of the treatments. The treatments T<sub>3</sub>, T<sub>4</sub>, T<sub>1</sub> and T<sub>2</sub> were found to be statistically at par with each

other. The length of fruit in control T<sub>7</sub> treatment was only 6.06 cm.

**Table-12: Length (cm) and Diameter (cm) of fruits as affected by different treatments**

<b>Treatments</b>	<b>Length of Fruits in (cm)</b>	<b>Diameter in (cm)</b>
T <sub>1</sub> – 100 % RDF (Inorganic)	7.40	0.90
T <sub>2</sub> – 100 % N through Vermicompost	7.20	0.80
T <sub>3</sub> – 100 % N through Neem cake	7.70	0.83
T <sub>4</sub> – 50 % RDF + 50 % N through Vermicompost	7.60	0.86
T <sub>5</sub> – 50 % RDF + 50 % N through Neem cake	9.50	1.30
T <sub>6</sub> – 50 % RDF + 25 % N through Neem cake + 25 % N through vermicompost	8.10	0.96
T <sub>7</sub> – Control	6.06	0.60
SE $\pm$	0.23	0.065
C.D. at 5%	0.70	0.200

The data presented in Table-12 also showed that the diameter of fruit was observed significantly more in all treatments than that of control (0.6 cm) except T<sub>2</sub> (0.8 cm).

The treatment T<sub>5</sub> - 50 % RDF + 50 % N through Neem cake showed significantly highest (1.3 cm) diameter of fruit, followed by T<sub>6</sub> - 50 % RDF + 25 % Neem cake + 25 % vermicompost were fruit diameter was 0.96 cm. However, treatment T<sub>6</sub>, T<sub>1</sub>, T<sub>4</sub> and T<sub>3</sub> at par with each other in respect of

fruit diameter. Whereas, control showed minimum diameter 0.6 cm.

#### **4.5 Economics**

The economics of the fertilizers applied in different treatment combination was worked out and presented in Table-13. The study revealed that wider cost benefit ratio (1 : 10.48) was observed under T<sub>5</sub> - 50 % RDF + 50 % N through Neem cake treatment, followed by treatment T<sub>1</sub> - 100 % RDF (1 : 6.26). The third best treatment was T<sub>6</sub> - 50 % RDF + 25 % N through Neem cake + 25 % N through Vermicompost where cost benefit ratio was (1 : 3.35). Under T<sub>5</sub> the cost benefit ratio was more than T<sub>1</sub> and the quality and marketable yield was also more as showed in Table 9, 10 and 11.

**Table 13 : Effect of different treatments on cost of cultivation/ cost benefit ratio.**

Treatments	Additional expenditure	Yield (kg/ha)	Additional Yield over control (kg/ha)	Additional monetary returns (Rs/ha)*	Cost benefit ratio
1	2	3	4	5	5/2
T <sub>1</sub> - 100 % RDF (Inorganic)	3120.00	8506.00	1222.00	19552	1 : 6.26
T <sub>2</sub> - 100 % N through Vermicompost	18000.00	8432.00	1148.00	18368	1 : 1.02
T <sub>3</sub> - 100 % N through Neem cake	8000.00	8634.00	1350.00	21600	1 : 2.70
T <sub>4</sub> - 50 % RDF + 50 % N through Vermicompost	10560.00	8691.00	1407.00	22512	1 : 2.13
T <sub>5</sub> - 50 % RDF + 50 % N through Neem cake	5560.00	10926.00	3642.00	58272	1 : 10.48
T <sub>6</sub> - 50 % RDF + 25 % N through Neem cake + 25 % N through vermicompost	8060.00	8975.00	1691.00	27056	1 : 3.35
T <sub>7</sub> - Control	Nil	7284.00	-	-	-

\* Chilli rate Rs 16 per kg.



*Discussion*

## CHAPTER V

# DISCUSSION

The experiment entitled “EFFECT OF ORGANIC AND INORGANIC FERTILIZERS ON GROWTH AND FRUIT YIELD OF GREEN CHILLI” was conducted at Horticultural Research Scheme (Vegetable crops), Sub campus, Marathwada Agricultural University, Parbhani during *Kharif* season of 2003-04. Different treatments combination of recommended dose of fertilizers, vermicompost and Neem cake were tried for chilli crop and the effects were noted in respect of vegetative growth, yield and fruit quality. The results obtained are discussed in this chapter.

In order to have sustainable production of vegetables, the use of organic and inorganic fertilizers is indispensable. Integration of organic manures and inorganic fertilizers as a source of plant nutrients help in reducing the amount of fertilizers required by the plant, at the same time it improves soil physico-chemical and biological properties. Now a days, Neem cake and vermicompost are being mostly used as organic manures. Neem cake gives antifedant effects, larval repellent and inhibit the growth and metamorphosis of insects (Ghule *et al.*, 2003).

Vermicompost is rich in major plant nutrients (N, P and K), secondary elements (Ca and Mg) and micronutrients (Fe, B, Zn, Mo, etc.). It also improves biological, physico-chemical properties, drainage, porosity and aeration of soil.

The present investigation was undertaken with the view to find out an appropriate combination of organic and

inorganic fertilizers to improve the growth, yield and quality of chilli crop. The effect of Neem cake and vermicompost were compared with inorganic fertilizers (N, P and K) when applied alone and in combinations. The results obtained in the present investigation are discussed in this chapter under different heads.

## **5.1 Vegetative growth**

The vegetative growth of chilli include plant height, primary branches, secondary branches, plant spread and number of leaves. These parameters are responsible for affecting the fruit yield of chilli. Inorganic fertilizers along with organic fertilization viz., Neem cake and vermicompost when applied to soil, plant nutrients are released on large scale and availability of plant nutrients increase which ultimately resulted in the increased vegetative growth and yield, was justified by Malewar *et al.* (1998) in chilli.

### **5.1.1 Height of plant**

It can be seen from Table-2 that organic source of nutrient along with inorganic fertilizers showed better response in terms of increase in plant height as compared to inorganic source alone and control. From 30 days after transplanting the differences among the treatments were clearly visible. The treatment T<sub>5</sub>-50% RDF + 50 % N through Neem cake recorded maximum plant height. The next best treatment in this regard was T<sub>1</sub>-100% RDF. The similar trend was observed during different dates of observation recorded.

Gadambe (2003) reported that application of 50% RDF + 50% Neem cake enhanced the height of chilli plants Cv. Pusa Jwala. In agreement with these results, Fugro (1996) observed

that application of Neem cake @ 2t/ha along with 75 : 25 : 25 kg NPK/ha showed maximum plant height of chilli. Similar results were reported by Damke *et al.* (1988) in chilli and Atiyeh *et al.* (1999) in tomato.

In general, it was observed that the height of plant was more under combined application of organic manures and inorganic fertilizers than that of their individual effect.

### **5.1.2 Number of primary and secondary branches per plant**

The data furnished in Table-3 and Table-4 showed that more number of primary and secondary branches per plant were accounted by the application of organic and inorganic fertilizers in combination. Amongst the organic source, Neem cake stimulated better response than vermicompost, in combination with inorganic fertilizers.

The maximum number of primary and secondary branches per plant were noticed in plants under the treatment T<sub>5</sub> - 50% RDF + 50 % N through Neem cake. It is well known that the microbial population increases at tremendous rate as organic matter decomposes in soil with subsequent release of nitrogen which helps in enhancing plant growth in respect of number of primary branches, secondary branches, number of leaves and plant height.

Inorganic fertilizers like urea, single super phosphate and murate of potash are the major sources of N, P and K but in these fertilizers leaching losses are more and causes the problem of ground water pollution. Organic manure like Neem cake and vermicompost improves physico-chemical and biological properties of soil. Neem cake acts as nitrification inhibitor hence reduces the nitrogen losses through leaching

(Ghule *et al.*, 2003). Vermicompost is rich source of plant macronutrients (N, P and K), secondary elements and micronutrients (Fe, B, Zn, Mo, etc.). The vermicompost improves drainage, porosity and aeration of soil. Organic manures corrects the pH of soil and increase the activity of beneficial micro-organism and ultimately availability of plant nutrients increased.

Mallangouda *et al.* (1995) showed that application of NPK and combination with FYM improved plant height and number of branches in chilli. Similar results were reported in chilli by Umap (1998) and Barekar (2000).

### **5.1.3 Spread of plant**

Significant increase in spread of plant was observed in treatment T<sub>5</sub>-50% RDF + 50% N through Neem cake at 30, 60, 90 and 120 days after transplanting.

The results in regard to spread of plant indicated that the different treatments showed significant effect on spread of plant. The treatment T<sub>5</sub> produced maximum plant spread (31.46 cm) at 120 days after transplanting.

Gadambe (2003) reported that the plant spread of chilli was increased due to the application of 50 % RDF + 50 % N through Neem cake.

### **5.1.4 Number of leaves per plant**

In chilli crop the number of leaves per plot were significantly influenced by different treatment (Table-6). At 120 days after transplanting maximum leaves were produced and thereafter, there was slow rate of production of leaves. The treatment T<sub>5</sub>-50% RDF along with 50% Neem cake were found

more effective in producing number of leaves per plant (343.50) than other treatments and control. The number of leaves was minimum in control. The reason for increasing number of leaves per plant under combined treatment of inorganic and organic nutrient sources can be attributed to the solubilization effect of plant nutrients by addition of Neem cake and vermicompost leading to increased uptake of NPK as has been reported by Subbiah *et al.* (1982).

Rafi (2001) reported that in tomato number of leaves per plant were comparatively more with application of 50 % RDF + 50 % FYM.

Subba Rao and Ravishankar (2002) also found that in brinjal number of leaves per plant (124.6) were maximum with application of FYM combined with vermicompost. Similar results were obtained by Shelke *et al.* (1999) in brinjal and Shiyou *et al.* (1999) in capsicum.

## **5.2 Reproductive growth**

### **5.2.1 Days to flower initiation and 50 % flowering**

The data presented in Table-7 clearly indicate that the findings in respect of days for flower initiation and 50 per cent flowering significantly affected by various treatments of organic and inorganic fertilizers. The minimum number of days for initiation of first flower (34.46) and 50 per cent flowering (38.46) were observed in treatment T<sub>5</sub>-50% RDF + 50% N through Neem cake. The control treatment required maximum number of days (41.66) for flower initiation and 50% flowering (45.73) in case of chilli crop.

The more number of days for flower initiation in control treatment may be due to inadequate availability of nutrients resulting into more time to complete the vegetative growth.

These results are in agreement with Kumaran *et al.* (1998) in tomato, Barekar (2000) in chilli and Gadambe (2003) in chilli. Early flowering brought out by combined treatments can be attributed to synergistic effect, early in vigour plant growth might have helped in synthesizes of cytokinin by these plant. Satisfactory growth of plant is helpful in translocation of synthesized cytokinin and phosphorus through the xylem vessels. Eventually the accumulation of cytokinin and phosphorus in these axillary buds might have favoured to enter into reproductive phase (Nanthakumar and Veeraragavathatham, 1999).

### **5.2.2 Fruit set percentage and number of days required from fruit set to harvest**

The fruit set percentage and number of days required from fruit set to harvest were significantly influenced by different fertilizer application (Table-8). The treatment T5-50% RDF + 50% N through Neem cake recorded significantly maximum fruit set (59.66 %) and less number days (7.93) from fruit set to harvest. The control treatment showed minimum fruit set percentage (43.06) and maximum days (12.60) from fruit set to harvesting. This may be due to unavailability of the major and minor nutrients in control treatment.

The application of combined dose of chemical fertilizers and Neem cake improves physico-chemical and biological properties of soil resulting in increased availability of nutrients.

This might have helped reduction of number of days from fruit set to harvesting of fruits.

### **5.3 Yield**

#### **5.3.1 Number of fruit per plant, weight of fruit pre plant**

It can be seen from Table-9 that the organic and inorganic fertilizer treatments significantly affected the number as well as weight of fruit per plant. The number of fruit per plant (136.66) and weight of fruits per plant (331.72 g) were recorded significantly more in treatment T<sub>5</sub>-50% RDF + 50% N through Neem cake. The minimum number of fruit (83.00) and less weight of fruit per plant (223.73 g) was observed in control treatment. This can be attributed to the inadequate availability of nutrients in control.

Kumaran *et al.* (1998) revealed that application of organic manure combined with recommended dose of inorganic fertilizers gave more fruit weight and more number of fruits per plant of tomato. These results are in agreement with the result reported by Umap (1998) in chilli and Abusaleha and Shanmugavelu (1988) in Okra.

#### **5.3.2 Yield**

It can be seen from Table-10 that there were significant differences among different treatments in respect of yield per hectare.

The treatment T<sub>5</sub>-50% RDF + 50% N through Neem cake emerged significantly superior in production of yield (109.26 q/ha) over the all other treatments. The lowest yield (72.84 q/ha) was observed in control. These findings are in line with Warade *et al.* (1995) who indicated that the application of 100 :

50 : 50 kg NPK/ha in combination with FYM 40 t/ha produced highest onion bulb yield.

Natrajan (1990) also found that the application of basal dose of NPK 75 : 35 : 33 kg/ha + 25 t/ha FYM through soil gave the highest yield of dry chilli (1.83 t/ha) than that of control. Similar results were also obtained in chilli crop by Nair and Peter (1990), Mallango, *et al.* (1995), and Fugro (1996). Raut (1998), Sharma and Arya (2001) and Rafi *et al.* (2002) also reported similar results in okra, cabbage and tomato, respectively.

## **5.4 Fruit quality**

### **5.4.1 Length of fruit, diameter of fruit, weight of individual fruit and number of seeds per fruit**

The data presented in Table-11 and Table-12 clearly showed that the maximum length (9.50 cm), diameter (1.30 cm), weight of individual fruit (2.63 g) and number of seeds per fruit (29.93) were recorded in chilli due to application of 50 % RDF + 50% N through Neem cake.

This is in accordance with the findings of Dange (2001) who noted increased fruit length, fruit breadth and number of seeds per fruit due to application of 50 % RDF + 50 % celrich as organic manure in chilli. These results are in agreement with Barekar (2000) who observed maximum length and breadth of chilli fruits due to application of 150 : 50 : 50 kg NPK/ha + 10 t FYM/ha in combination with PSB as biofertilizer. Khan and Suryanarayana (1977) in chilli, Abusaleh (1982) in okra also reported similar results.

Length of fruit, diameter of fruit, weight of individual fruit and number of seeds per fruit were found to be increased with

the application of 50% RDF + 50% N through Neem cake. It may be due to positive effect of Neem cake and availability of nutrients in the soil and eventually better assimilation of metabolism in plants resulting in superior reproductive health and fruit quality.

### **5.5 Economics**

The data from Table-13 indicated that the wider cost benefit ratio was found under T<sub>5</sub>- 50% RDF + 50% N through neem cake (1 : 10.48). The next to T<sub>5</sub> the cost benefit ratio was wider under T<sub>1</sub>-100% RDF (1 : 6.26) treatment. The highest cost benefit ratio due to application of 50 % RDF + 50 % N through Neem cake can be attributed for increasing total yield, marketable yield and improved fruit quality.

The treatment T<sub>5</sub> gave maximum monetary returns Rs. 58, 272 as compared to control and other treatments in chilli. This is in accordance with finding of Sharma (1995) who observed that application of 10 t compost + fermented cowdung @ 2 liter/m<sup>2</sup> gave maximum monetary returns Rs. 28, 986/ha with a cost benefit ratio of 1 : 3.06 as compared to control and other treatments in okra. Similar results were also reported by Singh *et al.* (1997) in *Rabi* onion, Yadav *et al.* (2002) in cabbage and Yadav and Yadav (2002) in onion.

*Summary*

*&*

*Conclusion*



## CHAPTER VI

# SUMMARY AND CONCLUSION

### SUMMARY :

The present investigation entitled, "EFFECT OF ORGANIC AND INORGANIC FERTILIZERS ON GROWTH AND GREEN FRUIT YIELD OF CHILLI" was conducted during *Kharif* season of 2003-04 at Horticultural Research Scheme (Vegetable crops), Sub campus, Marathwada Agricultural University, Parbhani.

The main objective of conducting the experiment was to assess the effect of organic and inorganic fertilizer combinations on growth and green fruit production of Pusa Jwala chilli.

The experiment was conducted in simple Randomized Block Design (RBD) with three (3) replication and seven (7) treatments. The Pusa Jwala variety was selected to study the effect of organic and inorganic fertilizer on growth and production of chilli.

The results obtained in respect of various characters are summarized in this chapter.

### 6.1 Vegetative growth

#### 6.1.1 Height

In this regard, treatment T<sub>5</sub> – 50 % RDF + 50% N through Neem cake found to be significantly superior in height of the plant (51.60 cm) at 120 days after transplanting, followed by treatment T<sub>1</sub> – 100% RDF (46.20 cm). The lowest height of plant was observed in treatment T<sub>7</sub>- control (36.23 cm).

### **6.1.2 Primary branches**

The number of primary branches per plant were observed statistically more in treatment T<sub>5</sub> - 50 % RDF + 50% N through Neem cake (8.85) at 120 days after transplanting, followed by treatment T<sub>6</sub>- 50 % RDF + 25 % Neem cake + 25 % vermicompost (8.50) which was statistically similar to T<sub>4</sub> (8.33). The lowest number of primary branches recorded in treatment T<sub>7</sub>-control (6.78).

### **6.1.3 Secondary branches**

In respect of number of secondary branches per plant at 120 days after transplanting, the treatment T<sub>5</sub> - 50 % RDF + 50% N through Neem cake (24.73) was found to be significantly superior over all the treatments.

The treatments T<sub>2</sub> (19.66), T<sub>3</sub> (19.33) and T<sub>7</sub> (18.53) were statistically similar to each other. The lowest number of secondary branches were recorded in treatment T<sub>7</sub>-control (18.53) at 120 days after transplanting.

### **6.1.4 Spread of plant**

In regard to spread of plant, treatment T<sub>5</sub> - 50 % RDF + 50% N through Neem cake (31.46 cm) which was found to be significantly superior over all treatments at 120 days after transplanting. The treatments T<sub>4</sub> (28.93 cm), T<sub>6</sub> (28.66 cm) and T<sub>1</sub> (27.93 cm) were statistically similar to each other. The lowest spread of plant was in treatment T<sub>7</sub>-control (25.35 cm) at 120 days after transplanting.

### **6.1.5 Leaves per plant**

Treatment T<sub>5</sub> - 50 % RDF + 50% N through Neem cake was observed to be significantly superior in number of leaves

per plant (343.50) at 120 days after transplanting, followed by treatment T<sub>6</sub> (318.50) which was similar to T<sub>4</sub> (311.67). The lowest number of leaves per plant was found in treatment T<sub>7</sub>-control (222.17) at 120 days after transplanting.

## **6.2 Reproductive Parameters**

### **6.2.1 Flower initiation**

The treatment T<sub>5</sub> – 50 % RDF + 50% N through Neem cake was found to be earliest in flower initiation (34.46 DAT), followed by treatment T<sub>6</sub>-50% RDF + 25 % Neem cake + 25% vermicompost (38.20 DAT). The late flower initiation reported in treatment T<sub>7</sub>- control (41.60 DAT).

### **6.2.2 50 per cent flowering**

Among the different combinations treatment T<sub>5</sub> – 50 % RDF + 50% N through Neem cake emerged significantly superior in earliest 50 per cent flowering (38.46 DAT). The next superior treatment was T<sub>6</sub>- 50% RDF + 25 % Neem cake + 25 % vermicompost (42.20 DAT). The late 50 per cent flowering was observed in treatment T<sub>7</sub>-control (45.73 DAT).

### **6.2.3 Fruit set**

Treatment T<sub>5</sub> – 50 % RDF + 50% N through Neem cake had significantly highest percentage of fruit set (59.66 %) followed by treatment T<sub>6</sub> – (57.13 %). Lowest fruit set was observed in treatment T<sub>7</sub>- control (43.06 %).

### **6.2.4 Days from fruit set to harvest**

Among the different combination treatment T<sub>5</sub> – 50 % RDF + 50% N through Neem cake required less number of days from fruit set to harvest (7.93 days) which was at par with T<sub>6</sub> (8.06

days). The maximum days required from fruit set to harvest in treatment T<sub>7</sub>- control (12.60).

### **6.3 Yield attribution parameters**

#### **6.3.1 Fruits per plant**

The highest number of fruits per plant were recorded in treatment T<sub>5</sub> – 50 % RDF + 50% N through Neem cake (136.66), followed by treatment T<sub>6</sub>- 50 % RDF + 25% Neem cake + 25% vermicompost (121.00). The lowest number of fruits per plant were observed in treatment T<sub>7</sub>-control (83.00).

#### **6.3.2 Weight of fruit per plant**

The treatment T<sub>5</sub> – 50 % RDF + 50% N through Neem cake (331.72 g) was found to be significantly superior over all other treatments in respect of weight of fruits per plant. The lowest weight of fruit per plant was observed in treatment T<sub>7</sub> – control (223.73 g).

#### **6.3.3 Yield**

The yield (109.26 q/ha) was recorded in treatment T<sub>5</sub> – 50 % RDF + 50% N through Neem cake which was significantly superior over all other treatments followed by T<sub>6</sub>-50% RDF + 25% Neem cake + 25% vermicompost (89.75 q/ha). The lowest yield per hectare was obtained in treatment T<sub>7</sub>-control (72.84 q/ha).

### **6.4 Quality parameters**

#### **6.4.1 Weight of individual fruit**

The treatment T<sub>5</sub> – 50 % RDF + 50% N through Neem cake produced maximum weight of individual fruit (2.63 g) which was statistically similar to T<sub>6</sub>-50% RDF + 25 % Neem cake + 25

% vermicompost (2.57 g). The lowest weight of individual fruit was recorded in treatment T<sub>7</sub>-control (2.36 g).

#### **6.4.2 Number of seeds per fruit**

Treatment T<sub>5</sub> – 50 % RDF + 50% N through Neem cake was found to be highest in number of seeds per fruit (29.93), which was at par with T<sub>6</sub> (27.33). The lowest number of seeds per fruit were observed in treatment T<sub>7</sub>-control (17.13).

#### **6.4.3 Length of fruit**

The maximum length of fruit was found in treatment T<sub>5</sub> – 50 % RDF + 50% N through Neem cake (9.50 cm), followed by treatment T<sub>6</sub>- 50% RDF + 25% Neem cake + 25% vermicompost (8.10 cm). Lowest fruit length was recorded in treatment T<sub>7</sub>-control (6.07 cm).

#### **6.4.4 Diameter of fruit**

Among the different treatments the T<sub>5</sub> – 50 % RDF + 50% N through Neem cake recorded maximum fruit diameter (1.3 cm) followed by treatment T<sub>6</sub>- 50% RDF + 25 % neem cake + 25% vermicompost where fruit diameter was 0.96 cm. The lowest diameter do fruit was observed in treatment T<sub>7</sub> – control (0.6 cm).

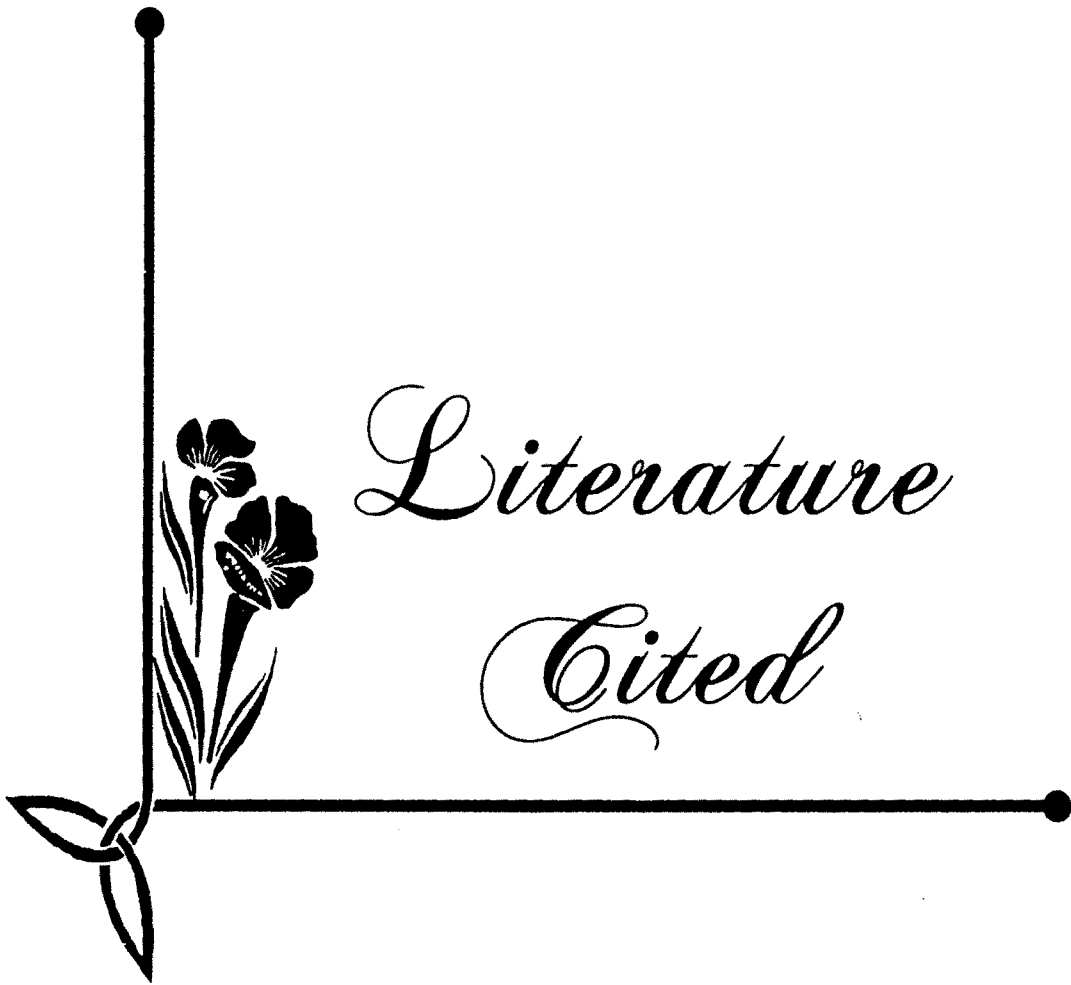
#### **6.5 Economics**

The study revealed that wider cost-benefit ratio (1:10: 48) was observed under 50% RDF + 50 % Neem cake followed by treatment T<sub>1</sub>-100 % RDF. The third best treatment was T<sub>6</sub>- 50% RDF + 25% Neem cake + 25% vermicompost where cost benefit ratio was 1:3.35.

## **CONCLUSION :**

On the basis of present findings it can be concluded that, under Parbhani conditions the application of 50% RDF (60:40:25 kg NPK/ha) + 50 % N through Neem cake (1t/ha) as a organic manure was significantly effective for enhancing plant growth, yield attributing parameters, green fruit yield and quality of chilli (Var. Pusa Jwala).

In order to confirm the present results some more trials are needed.



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*Appendix*

## APPENDIX - I

Meteorological Data from May 2003 to December 2003

Recorded at Meteorological Observatory, Marathwada Agricultural  
University, Parbhani.

Month	Rainfall (mm)	Rainy days	Temperature (°C)		Relative Humidity (%)		Evapo- ration (mm / day)	BSS (hrs / day)
			Max.	Min.	AM.	PM.		
<b>May</b>								
18	0	0	41.8	22.7	40	17	12.3	12.1
19	0	0	42	22.4	42	16	12.4	11.2
20	0	0	43.6	26.3	45	18	14.2	10.9
21	0	0	42	26.6	49	21	14.2	12.4
<b>June</b>								
22	0	0	42.5	27.5	47	20	13.5	10.4
23	0	0	41.8	39.4	52	26	14.5	11.6
24	48	4	36.1	37.7	79	56	8.1	7.8
25	18	3	34.3	23.5	84	69	6	5.9
26	13.2	1	32.4	23.3	79	50	4.5	4.3
<b>July</b>								
27	121.6	5	32.5	23	88	64	4.3	6.1
28	112.5	5	32.2	23	91	65	4.6	7.3
29	147.8	6	29	22.8	96	78	3.3	2.8
30	34.9	4	29.5	22.7	91	76	4	1.6
<b>August</b>								
31	12.3	2	30.9	22.4	83	65	4.1	5.4
32	30.9	2	29.2	22.8	89	76	3.2	3.6
33	7	1	31.2	21.9	86	60	4.9	6.6
34	75.8	3	29.4	21.7	90	76	3.6	4.7
35	27.1	2	29.7	21.5	84	72	4.3	6.2
<b>September</b>								
36	9.4	2	30.5	21.3	86	62	4.8	5.4
37	1.4	0	31.9	21.3	78	57	5.7	9.2
38	9.3	1	32.6	22.6	85	58	5.5	7.2
39	8.8	1	30.8	22.2	89	62	4.3	4.9
<b>October</b>								
40	11.4	1	33	20.5	72	53	6	10.2
41	1.2	0	33.6	18.8	78	47	5.6	9.2
42	2.5	1	33.9	17.5	72	36	5.8	10.6
43	0	0	32.2	16.1	75	44	6	9.3

Month	Rainfall (mm)	Rainy days	Temperature (°C)		Relative Humidity (%)		Evapo- ration (mm / day)	BSS (hrs / day)
			Max.	Min.	AM.	PM.		
<b>November</b>								
44	33.9	1	32.1	20.1	78	50	5.3	7.2
45	0	0	32.2	13	81	30	5.6	10.5
46	0	0	31.6	13.4	79	32	5.3	10.7
47	0	0	31.6	12.2	76	35	5.5	10.7
<b>December</b>								
48	0	0	31.6	13.4	82	35	4.8	9.8
49	0	0	30.9	9.9	74	34	4.1	10.5
50	0	0	30.6	10	78	30	4.7	10.3
51	0	0	27.7	8.6	80	33	4.3	10.5
52	0	0	28	11.2	81	38	4.3	9.1

## **APPENDIX-II**

### **Cost of inorganic fertilizers, Neem cake and Vermicompost**

1.	Urea (50 kg/bag)	Rs. 240
2.	SSP (50 kg/bag)	Rs. 150
3.	Muriate of potash (50 kg/bag)	Rs. 220
4.	Neem cake @ 100 kg/bag	Rs. 400
5.	Vermicompost @ 100 kg/bag	Rs. 300