



Short communication

Productivity in chilli (cv. LCA 334) as influenced by organic and inorganic nutrient management in vertisols

S. Bharathi, S. Surya Kumari and K. Uma Jyothi

Regional Agricultural Research Station,
Lam, Guntur- 522034, India
E-mail: bharathi_says@yahoo.com

ABSTRACT

A field experiment was conducted at Regional Agricultural Research Station, Lam, Guntur during the kharif season of 2003-04 and 2004-05 in vertisols with an objective to assess effectiveness of organic nutrient package for yield sustainability and to assess inorganic nutrient management package *vis-a-vis* organic package for yield and quality in chilli cv. LCA 334. Farmers of this region generally use very high doses of inorganic fertilizers with improper nutrient balance which has led to deterioration of productivity and quality of both the produce soil. The experiment was carried out in randomized block design with ten treatments, in combinations of organic and inorganic sources. The organic sources used were: green manure (incorporation of pillipesara), neem cake, *Azospirillum*, phosphate solubilizing bacteria, VAM and burnt ash, and integrated with 50%, 75% and 100% recommended nitrogen in the form of chemical fertilizer. Results revealed that maximum dry chilli yield (5397kg ha^{-1}) was recorded in combined application of green manure, neem cake, *Azospirillum*, phosphate solubilizing bacteria, burnt ash along with 100% recommended nitrogen.

Key words: Chilli, organic, inorganic nutrient management

Eco friendly, scientific method of crop production envisages use of organics in the soil as a source of nutrients. Inorganic nutrients play an important, direct role in yield and its attributes, as well as uptake of nutrients. However, use of organics along with inorganic nutrients not only helps increase the yield of crops, but also acts as a storehouse of nutrients, besides improving physical condition of the soil and quality of the produce. Chilli is one of the important commercial crops in the Krishna zone. Chilli, being a long duration crop, requires proper manuring and fertilizing in the surface soil is because of its shallow root system, for attaining high yields and quality produce (Bidari, 2000). The escalating cost of fertilizers, their hazardous polluting effects on environment and quality of the produce, there is a growing awareness among the farming community of the advantages of organic fertilizers. Therefore the present investigation was undertaken to study the effect of organic, inorganic and biofertilizers for yield improvement in chillies in vertisols.

A field experiment was conducted at Regional Agricultural Research Station, Lam, Guntur, during *kharif*

2003-04 and 2004-05. The experiment was laid out in randomized block design, with ten treatments replicated thrice. Treatments were as follows:

- T1 - Green manure (sunhemp) + Neem cake @ 2t/ha + *Azospirillum* @ 2kg/ha + Burnt ash (crop residue) + Phosp obacteria
- T2 - Green manure (sunhemp) + Neem cake @ 2t/ha + *Azospirillum* @ 2kg/ha + Burnt ash (crop residue) + Phosp obacteria + 50% of recommended dose of nitrogen
- T3 - Green manure (sunhemp) + Neem cake @ 2t/ha + *Azospirillum* @ 2kg/ha + Burnt ash (crop residue) + Phospobacteria +75% of recommended dose of nitrogen
- T4 - Green manure (sunhemp) + Neem cake @ 2t/ha + *Azospirillum* @ 2kg/ha + Burnt ash (crop residue) + Phospobacteria +100% recommended dose of nitrogen
- T5 - Green manure (sunhemp) + *Azospirillum* @ 2kg/ha

- T6 - Green manure (sunhemp) + *Azospirillum* @ 2kg/ha + 50% of recommended dose of nitrogen
 T7 - Green manure (sunhemp) + *Azospirillum* @ 2kg/ha + 75% of recommended dose of nitrogen
 T8 - Green manure (sunhemp) + *Azospirillum* @ 2kg/ha + 100% of recommended dose of nitrogen
 T9 - Recommended NPK (200-60-80)
 T10 - Farmers' practice (300-200-60)

The crop was raised with a spacing of 60cm x 30cm. Standard cultural practices recommended were followed and fertilizers were applied as per treatments. Green manure crop (sunhemp) was raised @ 20 kg seed per hectare and was applied at the preflowering stage. By this practice, 30 tonnes of biomass per hectare on freshweight basis was added to the soil. Data on growth characters, yield attributes, yield, fruit rot incidence and quality analysis, *i.e.*, oleoresin and capsanthin content were recorded.

Data on growth parameters (Table 1) revealed that application of organic manure with recommended dose of inorganic nitrogen showed superior performance in respect of growth and yield. Maximum plant height (96.2cm) and plant spread (101.5cm) was recorded with 100% recommended inorganic nitrogen in combination with organics-green manure (sunhemp) + Neem cake @ 2t/ha + *Azospirillum* @ 2kg/ha + Burnt ash (crop residue) + Phosphobacteria. This is in accordance with findings of Montagu and Goh (1990) in tomato. Number of fruits per plant (which is one of the most vital attributes) considerably increased with combined application of organic and bio

fertilizers along with inorganic nitrogen, than treatments which received inorganic fertilizers alone. The highest number of fruits per plant was recorded in T4 (301), followed by T8 (281.5) and these were almost on par with each other, and significantly superior to other treatments. This could be attributed to the solubilization effect of plant nutrients by addition of organics, leading to increased uptake of NPK, as reported by Subbiah *et al* (1984). Similar and Nanthakumar and Veeraraghavatatham (1999). Lowest number of fruits per plant was recorded in T1 (109) and T5 (101) which received only organics.

There was no significant difference among treatments in 100 pod weight and number of primary branches per plant (Table 2). The highest dry chilli yield was recorded in T4 (5397 kg/ha) which was almost on par with T8 (4885 kg/ha). Results revealed that combined application of organics with recommended dose of inorganic fertilizers gave superior yield. Similar results were reported by Nair and Peter (1990) in chilli and by (Poopathi, 1994) tomato.

On the other hand, among the quality parameter analyzed, there was no significant difference in, oleoresin content. However, the highest oleoresin content was recorded in T1 (9.8%) which received only organics. Significantly, higher capsanthin (EOA colour value) was recorded in T1 (10056), followed by T5 (9845). This might be due to physiological influence of *Azospirillum*, neem cake and phosphobacteria on the activity of enzymes. Similar observations were reported by Dhanalakshmi (1989) in tomato.

Further, fruit rot incidence was also significantly low

Table 1. Effect of organics and inorganics on yield attributes and yield in chilli

Treatment	Plant height (cm)			Plant spread (cm)			No of fruits / plant			No. of primary branches / plant		
	03-04	04-05	Mean	03-04	04-05	Mean	03-04	04-05	Mean	03-04	04-05	Mean
T1: Greenmanure +Neem cake +Azosp + PSB+VARM+Burnt ash	81.7	71.6	76.6	77.6	74.2	75.9	108	110	109.0	3.7	3.3	3.5
T2: T1+50% rec.N	85.1	75.01	80.0	86.4	78.6	82.5	132	120	126.0	4.0	4.5	4.25
T3: T1+75% rec.N	92.2	82.2	87.2	96.7	87.3	92.0	219	210	214.5	3.8	3.8	3.8
T4: T1+100% rec.N	101.2	91.2	96.2	107.6	95.4	101.5	310	300	301.0	4.5	3.9	4.2
T5: Green manure +Azosp+PSB	79.9	69.9	74.9	74.4	67.6	76.4	97	105	101.0	3.6	3.7	3.65
T6: T5+50% rec.N	83.0	73.0	78.0	83.0	83.8	83.4	115	115	115.0	4.0	5.0	4.5
T7: T5+50% rec.N	91.5	81.5	86.5	95.9	84.7	90.3	160	190	175.0	4.3	3.0	3.65
T8: T5+50% rec.N	97.5	87.5	92.5	103.4	93.4	98.4	298	275	281.5	3.9	3.6	3.75
T9: Rec. NPK (200:60:80)	99.4	89.4	94.4	94.6	92.5	93.2	265	270	267.5	3.8	3.6	3.7
T10: Farmers' practice (300:200:50)	98.3	88.3	93.3	92.2	89.1	90.7	264	260	262.0	4.4	3.9	4.15
CD(P=0.05)	10.64	12.7	11.6	12.69	15.8	14.2	33.6	15.2	21.2	NS	NS	NS
CV%	6.8	9.2	8.0	8.1	10.5	9.3	10.8	8.7	9.8			

Table 2. Effect of organics and inorganics on yield attributes and yield in chilli

Treatment	100 pod weight (g)			Days to 50% flowering			Yield (kg ha ⁻¹)		
	03-04	04-05	Mean	03-04	04-05	Mean	03-04	04-05	Mean
T1: Green manure +Neem cake +Azosp +PSB+VARM+Burnt ash	69.0	72.6	70.8	53.2	59.6	56.4	2690	2590	2640
T2: T1+50% rec.N	71.0	70.0	70.5	58.0	60.0	59.0	2880	2680	2780
T3: T1+75% rec.N	70.6	72.2	71.4	60.5	62.3	61.4	3510	3250	3380
T4: T1+100% rec.N	71.5	72.5	72.0	62.3	60.5	61.8	5494	5300	5397
T5: Green manure +Azosp+PSB	72.0	71.0	71.6	58.9	54.4	56.6	2510	2450	2480
T6: T5+50% rec.N	70.2	71.6	70.9	57.8	60.0	58.9	2790	2500	2645
T7: T5+50% rec.N	70.1	71.5	70.8	60.0	58.0	59.0	3070	2980	3025
T8: T5+50% rec.N	71.7	71.9	71.8	61.0	58.0	59.5	4820	4950	4885
T9: Rec.NPK (200:60:80)	70.2	70.8	70.6	56.0	60.0	58.0	4020	4780	4400
T10: Farmers' practice (300:200:50)	70.6	70.2	70.4	61.0	57.0	59.0	3957	4650	4304
CD(<i>P</i> =0.05)	NS	NS	NS	NS	NS	NS	739	647	693
CV%							12.5	10.4	11.5

NS = Non-Significant

Table 3. Effect of organics and inorganics on yield and quality in chilli (Mean data 2003-2005)

Treatment	Fruit set (%)	Oleoresin content (%)	Capsanthin content (EAO)	Damaged pods (% Fruit rot incidence)
T1:Greenmanure+Neem cake +Azosp + PSB+VAM+Burnt ash	59.8(50.7)	9.8	10056	11.99 (20.36)
T2:T1+50% rec.N	58.7(50.0)	9.2	9507	14.03 (22.19)
T3:T1+75% rec.N	58.7(50.0)	9.1	9416	15.07 (22.83)
T4:T1+100% rec.N	63.2(52.5)	9.1	8809	15.76 (23.43)
T5:Greenmanure+Azosp+PSB	56.3(48.9)	9.6	9854	12.20 (20.43)
T6:T5+50% rec.N	56.5(48.9)	9.6	9069	14.70 (22.38)
T7:T5+50% rec.N	57.5(49.2)	9.5	8896	16.83 (23.92)
T8:T5+50% rec.N	62.5(51.8)	9.5	8174	17.20 (24.49)
T9:rec.NPK(200:60:80)	56.5(48.9)	9.4	7868	20.95 (27.25)
T10:Farmers practice (300:200:50)	56.3(48.9)	9.4	7858	21.71 (27.77)
CD(<i>P</i> =0.05)	2.5	NS	60.68	2.6
CV%	6.8		2.4	6.5

Figures in parantheses are angular transformed values

in organic treatments T1 (11.99%) and T5 (12.20%). Maximum fruit rot was recorded in treatments T9 (20.95%) and T10 (21.71%) which received only inorganic fertilizers. Organic manures, however, showed an advantage over the recommended practices in terms of fruit quality (Table 3). The highest oleoresin and capsanthin content were seen in 'organics alone' treatment, which is consistent with other reports (Sharu, 2000). Lack of response to organics presumably owes to the present experimental site having been under chemical farming for several previous seasons. Moreover, long-term experimentation may be necessary to elucidate beneficial effects of the organics, especially, on aspects relating to soil health. Nonetheless, a gradual shift away from the chemical to organic practices seems a prudent choice for sustained crop production and the superior quality of produce.

Results of the study revealed that maximum dry chilli yield (5397kg ha⁻¹) can be obtained with 100% recommended dose of nitrogen in combination with green manure, neem cake, *Azospirillum*, burnt ash and phosphobacteria, followed by the treatment green manure *Azospirillum* along with 100% recommended dose of nitrogen (4885kg ha⁻¹). However the highest colour value and the lowest fruit rot incidence were recorded in organics. Monitoring phosphorous and potassium status in the soil is necessary for timely correction to balance these nutrients.

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