

Integrated nutrient management of chilli (*Capsicum annuum* L.) in Gangetic alluvial plains

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ABSTRACT

Six organic manures namely cowdung, neem cake, poultry manure, phosphocompost and vermicompost were applied in different combinations with inorganic nitrogenous fertilizer (urea) at three levels (25%, 50%, and 75%). The growth parameters like plant height and number of branches per plant was found maximum with the combination of vermicompost and urea at 50%. Increase in inorganic nitrogen level (25, 50 and 75%) in the growing media flowering was delayed compared to all organic manures. The yield attributes including fruit yield was found maximum also with nitrogen received from vermicompost and urea at 50% level. However, all the treatments showed the enhanced results over control (without nitrogen). The qualitative aspects were increased with the application of neem cake compared to other inorganic sources.

Keywords: Chilli, flowering, growth, INM, quality, yield

Chilli (*Capsicum annuum* L.), a member of family Solanaceae, is an important spice crop of West Bengal growing throughout the state. It is said to be a native of South America and are cultivated mainly in tropical and subtropical countries, including India. It is grown over an area of about 7.67 lakh ha with a production of 12.03 lakh tonnes and productivity 1.6t ha⁻¹ in 2009-2010 (Anon., 2011). In India the most important chilli growing states are Karnataka, Tamil Nadu, Orissa, Maharashtra, Rajasthan and West Bengal. Andhra Pradesh is the leading state in area and production. It is predominantly popular for its green pungent fruits, which is used for culinary purpose. Whereas the excessive use of inorganic source of nutrients for its cultivation creates health hazards, inclusion of organic manures with inorganic sources of nutrient is essential. It is found that integrated nutrient management with vermicompost, green manures and application of bio-fertilizers showed a significant positive response on chillies.

MATERIALS AND METHODS

The present investigation was carried out at Horticulture Research Station, Mondouri, Faculty of Horticulture, Bidhan Chandra Krishi Viswavidyalaya, Nadia, West Bengal in consecutive two seasons during 2008-09 and 2009-10 in chilli cv. Bulet with an objective to study the effect of organic and inorganic sources of fertilizer in different combination on its growth, flowering behaviour and fruit yield in Gangetic alluvial plains.

The plants were manured with six organic manures like cowdung, neem cake, poultry manure, vermicompost, phospho-compost and mustard cake along with inorganic source of nitrogen viz. urea. Full dose of organic manure including recommended dose

of P (single super phosphate) and K (muriate of potash) and ½ dose of urea was applied as basal. Rest amount of urea was applied after one month of transplanting. The seedlings were planted in the plots measuring 6.75m² with spacing of 60×45cm and replicated thrice following RBD with 19 treatments and 3 replications. Observations were recorded on different parameters and analyzed statistically as per Gomez and Gomez (1984). Capsaicin and ascorbic acid content of chilli were estimated following standard biochemical method (Sadasivam and Manickam, 1996).

RESULTS AND DISCUSSION

The average plant height of chilli (69.56 cm) was found maximum with 50% N from vermicompost + 50% N from urea (Table 1). It is seen that plant height increases with the increase in the level of inorganic nitrogen like urea (25 to 75%) and with reduced level of organic manure, whereas, reverse effect was found with neem cake, poultry manure, vermicompost and phospho-compost. The minimum (62.10 cm) plant height was recorded in control plot. The average number of branches per plant was found maximum (16.01) under the treatment with 50% N from vermicompost + 50% N from Urea over other treatments (Table 1). Whereas, number of branches per plant (12.83) was found the least, when plant was grown with only P and K (control) or manured with 25% N (CM) +75% N (Urea). Application of vermicompost (75%N) and urea (25%N) induced the earliest flowering in plants as compared to control (without N). On the other hand, flowering was delayed maximum, when plants were treated with 25% N from either cow dung manure or poultry manure + 75% N from urea.

Table 1: Effect of integrated nutrient management on growth and yield of chilli (pooled)

Treatments	Plant height (cm)	No. of branches plant ⁻¹	Days required to first flowering	No. of fruits plant ⁻¹	Fruit length (cm)	Fruit girth (cm)	Fruit yield (t ha ⁻¹)
T ₁ : 25% N(CM) +75% N(Urea)	64.34	12.87	48.25	90.86	3.24	4.57	5.95
T ₂ : 50% N(CM) + 50% N(Urea)	65.21	13.39	45.00	83.33	2.75	4.40	6.65
T ₃ : 75% N(CM) +25% N(Urea)	62.72	13.01	44.36	80.75	2.46	4.32	6.12
T ₄ : 25% N(NC) + 75%N(Urea)	63.16	13.17	44.37	110.75	3.45	5.06	6.16
T ₅ : 50% N(NC)+ 50%N(Urea)	65.23	13.28	46.18	112.45	3.48	5.19	7.87
T ₆ : 75% N(NC) + 25%N(Urea)	66.32	13.13	46.97	117.12	3.51	5.35	6.85
T ₇ : 25% N(PM) + 75%N(Urea)	62.10	13.49	48.21	85.36	2.87	4.10	5.87
T ₈ : 50% N(PM) + 50%N(Urea)	67.38	15.47	45.33	88.26	2.95	4.50	7.25
T ₉ : 75% N(PM) + 25%N(Urea)	68.19	14.43	44.37	78.28	2.35	4.10	6.93
T ₁₀ : 25% N(VC)+75% N(Urea)	66.47	15.08	46.28	129.75	3.76	5.57	8.17
T ₁₁ : 50% N(VC)+50% N(Urea)	69.56	16.01	44.52	136.37	4.01	5.70	8.65
T ₁₂ : 75% N(VC) +25% N(Urea)	68.42	15.18	42.75	121.85	3.66	5.27	8.46
T ₁₃ : 25% N(PC) + 75%N(Urea)	66.34	13.46	47.56	66.38	2.19	3.67	5.95
T ₁₄ :50% N(PC) + 50%N(Urea)	64.31	14.06	46.37	76.17	1.99	3.80	6.32
T ₁₅ :75% N(PC) + 25%N(Urea)	65.54	13.72	44.25	72.24	2.05	3.92	5.55
T ₁₆ : 25% N(MC)+ 75% N(Urea)	66.72	14.25	46.18	95.27	2.27	3.82	7.08
T ₁₇ :50% N(MC)+50% N(Urea)	65.59	14.72	45.42	105.25	3.36	4.99	7.56
T ₁₈ : 75% N(MC)+ 25% N(Urea)	63.32	14.36	45.05	99.75	3.26	4.93	6.72
T ₁₉ : Control	61.24	12.83	43.32	68.16	1.87	3.64	3.72
SEm (±)	0.36	0.20	0.68	2.00	0.33	0.61	0.63
LSD (0.05)	1.06	0.58	2.01	5.95	0.98	1.80	1.86

It has been also indicated that, increase in inorganic nitrogen level in the growing media, flowering was delayed compare to all the organic manures (Table 1). With application of 50% N from vermicompost + 50% N from urea highest yield of individual plant (136.37 fruits) was obtained over other treatments. The minimum (68.16) number of fruits per plant was produced by untreated plant. In this context, Singh and Kumar (1999) reported that highest fruit setting percentage and number of fruits per plant of chilli was found, when 90kg N ha⁻¹ was applied both from organic and inorganic sources. The treatment combination of 50% N from vermicompost + 50% N from urea produced the highest length of fruit (4.01cm) which was statistically *at par* with T₁₀ (25% N from vermicompost + 75% N from urea

whereas, the minimum (1.87 cm) fruit length was obtained from control. Among the different treatments the maximum (5.70 cm) fruit diameter was shown in 50% N from vermicompost + 50% N from urea. The minimum (3.64 cm) was found in control plot. The fruit yield per ha showed highly significant variation among the treatments. Though maximum yield was obtained when soil was enriched with vermicompost and urea, whereas other organic manures like cow dung manure, poultry manure, neem cake, phosphocompost and mustard cake also improved yield to some extent. The maximum (8.65 t/ha) fruit yield was obtained when plants were treated with 50% N from vermicompost + 50% N from urea. Chopra *et al.* (2005) found the superior yield of chilli genotypes with organic and inorganic nutrient combination.

Usha Rani *et al.* (2002) observed that the availability of phosphorus content increases up to 200% in the soil during cultivation of chilli, when NPK + FYM @ 10t ha⁻¹ is used in the soil followed by vermicompost @ 2.5t ha⁻¹ with the same level of inorganic fertilizer. The minimum yield (3.72t ha⁻¹) was obtained with control plot *i.e.* without N. Fruit samples were collected when the fruits started ripening and were analyzed to find out the capsaicin and ascorbic acid

status of the fruits. The highest content of capsaicin and ascorbic acid in fruit were recorded when plants were treated with 75% N from neem cake and 25%N from urea, whereas plants when manured with 25%N from cow dung manure + 75% N from urea recorded fruits having the poorest level of capsaicin (Table 2). Maximum ascorbic acid (177.60mg100⁻¹g) of green chilli was noted with 75% N from neem cake + 25% N from urea.

Table 2: Effect of integrated nutrient management on quality of chilli

Treatments	Capsaicin (mg g ⁻¹ dry biomass)	Ascorbic acid (mg 100 ⁻¹ g)
T ₁ : 25% N(CM) +75% N(Urea)	60.76	150.00
T ₂ : 50% N(CM) + 50% N(Urea)	77.96	152.00
T ₃ : 75% N(CM) +25% N(Urea)	106.60	153.00
T ₄ : 25% N(NC) + 75%N(Urea)	79.20	156.50
T ₅ : 50% N(NC) + 50%N(Urea)	107.60	170.00
T ₆ : 75% N(NC) + 25%N(Urea)	114.20	177.60
T ₇ : 25% N(PM) + 75%N(Urea)	76.80	122.80
T ₈ : 50% N(PM) + 50%N(Urea)	80.50	116.40
T ₉ : 75% N(PM) + 25%N(Urea)	93.80	114.60
T ₁₀ : 25% N(VC)+75% N(Urea)	90.60	165.60
T ₁₁ : 50% N(VC)+ 50% N(Urea)	99.56	142.50
T ₁₂ : 75% N(VC) +25% N(Urea)	113.90	167.60
T ₁₃ : 25% N(PC) + 75%N(Urea)	70.30	105.20
T ₁₄ : 50% N(PC) + 50%N(Urea)	72.43	110.60
T ₁₅ : 75% N(PC) + 25%N(Urea)	77.00	157.60
T ₁₆ : 25% N(MC)+75% N(Urea)	85.18	144.00
T ₁₇ : 50% N(MC)+50% N(Urea)	98.18	148.80
T ₁₈ : 75% N(MC)+25% N(Urea)	99.45	148.40
T ₁₉ : Control	82.60	120.60
SEm (±)	1.42	1.16
LSD (0.05)	4.42	3.11

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