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Effect of nitrogen and potassium sources on yield attributes and yield of chilli (*Capsicum annuum* L.)

S Suryakumari*, S Bharathi[1], K U Jyothi & P V Reddy

Horticultural Research Station, Dr. YSR Horticultural University,
Lam, Guntur, Andhra Pradesh.
**E-mail: surya.surepeddi@gmail.com*

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Abstract

In a field experiment the comparative efficacy of three sources of nitrogen *viz*., urea, calcium ammonium nitrate and ammonium sulphate and two sources of potassium *viz*., muriate of potash and sulphate of potash on yield attributes and yield in chilli cv LCA 353 was evaluated. Among the treatments tested the highest number of fruits per plant and yield was recorded in the treatment where the recommended nitrogen of 300 kg ha^{-1} was given 50% as urea and remaining 50% as CAN and recommended potassium of 120 kg ha^{-1} as 50% MOP and remaining 50% as SOP (228.4 fruits $plant^{-1}$ and 48.85 q ha^{-1}). However, in the treatment where the recommended nitrogen of 300 kg ha^{-1} was given 50% as urea and remaining 50% as AS/CAN and recommended potassium of 120 kg ha^{-1} as 50% MOP and 50% SOP were economical with C:B ratio of 1:1.95 as against control with 1:1.64 where split application of recommended N and K was given in single source as urea and muriate of potash.

Keywords: *Capsicum annum*, chilli, nitrogen, potassium, sources, yield

Chilli (*Capsicum annum* L.) is one of the important vegetable cum commercial spice crop grown in Andhra Pradesh, which ranks first in production and productivity in India. The Solanaceous group of vegetables (tomato, eggplant, chilli and bell peppers) generally takes up large amounts of nutrients depending upon the quantity of fruit and dry matter they produce, which is mostly influenced by a number of genetic and environmental variables. The quantity of nutrients which the farmer needs to apply depends on the yield potential of the cultivar and the level of available plant nutrients in the soil and growth conditions. Chilli, being a long duration and energy rich crop, requires proper manuring and balanced fertilization along with secondary nutrients for higher yield and quality produce (Prasad *et al.* 2009). Chilli, being indeterminate in nature, vegetative and reproductive stages overlap and the plants need nutrients even up to maturity and fruit ripening. Nutrient management as split application of fertilizers, use of different sources of fertilizers and their integrated use have proved to be very effective in increasing nutrient use efficiency, crop productivity and reducing nutrient losses (Shafeek *et al*. 2012).

[1]Regional Agricultral Research Station, ANGRAU, Lam, Guntur.

The mineral nutrients, N, P and K are known to affect growth and yield of the capsicums. In a study by Johnson & Decoteau (1996), macronutrients were shown to affect plant growth, fruit yield and pungency in Jalapeno pepper. Stroheim & Oebker (1979) reported that N applications in chili peppers showed a significant increase in plant growth characteristics, colour and nutrient content of leaves and yield. Related studies by Babu *et al.* (1998), established that by application of graded levels of Ca and P increased pepper yields. K functions as the key nutrient element for enhancing the productivity of vegetable crops. Plants should have adequate supply of potassium particularly at the time of fruit development and maturation. Potassium content in vegetables bears significant positive relationship with quality attributes. Ca application to plants increases ammonium, potassium and phosphorus absorption, stimulates photosynthesis and increases the size of sellable plant parts. In chillies, S plays an important role in increasing both the production and quality.

Keeping this in view a field experiment was conducted to study the comparative efficacy of three sources of N *viz*., urea, calcium ammonium nitrate (CAN) and ammonium sulphate (AS) and two sources of K *viz*., muriate of potash (MOP) and sulphate of potash (SOP) on yield attributes and yield in chilli cv LCA 353 in different splits during *Kharif* 2005–09 at Regional Agricultural Research Station, Lam, Guntur. The soil of the experimental site was slightly had pH-8.0, E.C-0.25 $dsm^{-1,}$ available N 189 kg ha^{-1}, available P of 36 kg ha^{-1} and exchangeable K 275 kg ha^{-1}The trial was laid out in randomized block design with 12 treatments in 3 replications. The treatment details are T_1 as Control with 300 kg N ha^{-1} RDN [Recommended dose (RD) of N] as urea + 120 kg K_2O ha^{-1} (RDK) as MOP, T_2 with 100% RDN (AS)+ 100% RDK (MOP), T_3 with 100% RDN (CAN) + 100% RDK (MOP), T_4 with 100% RDN (Urea) + 100% RDK (SOP), T_5 with 100% RDN (CAN) + 100% RDK (SOP), T_6 with 100% RDN (AS) + 100% RDK (SOP), T_7 with RDN (50% Urea + 50% AS) + RDK (50% MOP + 50% SOP), T_8 with RDN (50% Urea + 50% CAN) + RDK (50% MOP + 50% SOP), T_9 with RDN (75% Urea + 25% AS) + RDK (75% MOP + 25% SOP), T_{10} with RDN (75% Urea + 25% CAN) + RDK (75% MOP + 25% SOP), T_{11} with RDN (25% Urea + 75% AS) + RDK (25% MOP + 75% SOP), and T_{12} with RDN (25% Urea + 75% CAN) + RDF (25% MOP + 75% SOP).

All the treatments received a uniform basal dose of 60 kg P_2O_5 ha^{-1} as single super phosphate. The recommended dose of N & K @ 300:120 Kg ha^{-1} through difference sources like urea, CAN AS for N and MOP and SOP for K as per the treatments were applied in five splits. The chilli variety LCA 353 was raised in nursery in July-August and transplanted in September at a spacing of 60 cm × 30 cm in all the four years of study. The data was recorded in ten randomly selected plants in each treatment for yield attributes *viz.,* plant height, plant spread, 100 pod weight and number of fruits $plant^{-1}$ and were subjected to statistical analysis as per the standard procedures given by Gomez & Gomez (1984).

The mean values of 4 years study indicated that all the treatments recorded significant increase in plant height, spread, 100 pod weight, total number of fruits $plant^{-1}$ and yield compared to control. Maximum plant height (110.2 cm), plant spread (108.2 cm), 100 pod weight (54.5 g) and number of fruits $plant^{-1}$ (228.4) and maximum yield (48.85 q ha^{-1}) were recorded in the treatment T_8 where the recommended N of 300 kg N ha^{-1} was given as 50% urea and remaining 50% as CAN and recommended K of 120 kg ha^{-1} as 50% MOP and 50% as SOP in 5 splits. Similar results of the increase in total yield was reported in sweet pepper (*Capsicum annuum* L.) by Shafeek *et al.* (2012) when elemental Sulphur was applied in splits along with nitrogen sources increasing the solubility of calcium phosphate compounds in alkaline soils. This was followed by the treatment T_7 *ie*., where N was applied as 50% urea and 50% as AS and K was applied as 50% MOP and 50% as SOP in 5 splits, which recorded plant height of 100.5 cm, plant spread of 106.5 cm, 100 pod weight of 53.8 g and total number of fruits

Table 1. Effect of nitrogen and potassium sources on yield attributes and yields in chillies (Pooled result of 4 years)

Treatment details	Plant height (cm)	Plant spread (cm)	100 pod wt (g)	Number of fruits plant^{-1}	Yield q ha^{-1}	Cost of cultivation (Rs)	Gross returns (Rs)	C:B ratio
T_1- (Control) 100% RDN (Urea) + 100% RDK (MOP)	89.3	92.4	51.0	170.2	39.28	1,67,684	2,74,960	1: 1.64
T_2- 100% RDN (AS) + 100% RDK (MOP)	92.3	91.0	50.0	173.2	44.25	1,74,260	3,09,750	1: 1.78
T_3- 100% RDN (CAN) + 100% RDK (MOP)	95.2	95.8	49.1	179.5	46.28	1,77,260	3,28,700	1: 1.85
T_4- 100% RDN (Urea) + 100% RDK (SOP)	97.6	104.5	49.8	177.0	42.10	1,73,374	2,94,700	1: 1.70
T_5- 100% RDN (CAN) + 100% RDK (SOP)	90.6	93.2	50.2	188.0	46.25	1,82,950	3,23,750	1: 1.77
T_6- 100% RDN (AS) + 100% RDK (SOP)	87.8	94.8	51.5	180.1	45.21	1,79,950	3,16,470	1: 1.76
T_7- RDN (50% Urea + 50% AS) + RDK (50% MOP + 50% SOP)	100.5	106.5	53.8	221.5	48.35	1,73,817	3,38,450	1:1.95
T_8- RDN (50% Urea + 50% CAN) + RDK (50% MOP + 50% SOP)	110.2	108.2	54.5	228.4	48.85	1,75,317	3,41,950	1:1.95
T_9- RDN (75% Urea + 25% AS) + RDK (75% MOP + 25% SOP)	89.0	92.1	50.9	179.0	43.25	1,70,751	3,02,750	1:1.77
T_{10}- RDN (75% Urea + 25% CAN) + RDK (75% MOP + 25% SOP)	92.5	91.8	51.6	180.0	44.20	1,71,501	3,09,400	1:1.80
T_{11}- RDN (25% Urea + 75% AS) + RDK (25% MOP + 75% SOP)	90.4	92.0	51.3	178.5	43.28	1,77,825	3,02,960	1:1.70
T_{12}- RDN (25% Urea +75% CAN) + RDF (25% MOP + 75% SOP)	92.5	94.2	50.8	181.0	45.65	1,80,095	3,19,550	1:1.77
CD ($P<0.05$)	3.1	9.4	3.02	6.9	0.125	-	-	-
CV (%)	6.8	5.4	4.8	7.8	10.2	-	-	-

RDN=Recommended dose of nitrogen @300 kg N ha^{-1}; RDK=Recommended dose of potassium120 kg K ha^{-1}; AS=Ammonium sulphate; MOP=Muriate of potash; CAN=Calcium ammonium nitrate; SOP=Sulphate of potash plant^{-1} of 221.5 with a yield of 48.35 q ha^{-1}. The increased yield in all treatments over the control T_1 can be attributed to the availability of Ca and S through different sources *viz.*, CAN, AS, SOP. This resulted in increased photosynthetic efficiency and ability of scavenging the free radicals produced in the plant system and thus improving the general health of the plants. These results are in conformity with the findings of Singh (1988), Mazumdar *et al.* (2000), Ananthi *et al.* (2004) and Shivaprasad *et al.* (2009) in chilli. Similar effects of SOP were reported by Alagarswamy & Kumar (2008) in banana and Nagaih *et al.* (1998) in onion.

The economics of the experiment revealed that all the treatments recorded higher gross returns and net returns over the control indicating that split application of N and K as different sources is much economical and beneficial over split application as single source (Table 1). Among the treatments maximum gross returns (Rs. 3,41,950/- and Rs. 3,38,450/-) and higher net returns (Rs. 1,66,633/- and Rs. 1,64,633/-) with the highest C:B ratio of 1:1.95 was recorded in the treatments T_8 and T_7 where 50% of the recommended N *i.e.*, 300kg N ha^{-1} is given urea (50%) and CAN/AS (50%) and the recommended K of 120 kg ha^{-1} in the form of 50% MOP and 50% SOP. Hence, it can be concluded that in hot pepper the recommendation of 300 kg N ha^{-1} when given as 50% urea and 50% as CAN/AS and recommended K of 120 kg ha^{-1} applied as 50% MOP and 50% as SOP in five splits is profitable as it yields better than split application of recommended N and K as any single source.

References

Alagarswamy R K & Kumar N 2008 Studies on the efficacy of Sulphate of potash (SOP) on the physiological, yield and quality parameters of banana cv Robusta (Cavendish-AAA). EurAsia J. Bio. Sci. 2: 102–109.

Ananthi S, Veeraragavathatham D & Srinivasan K 2004 Comparative efficacy of muriate of potash and sulphate of potash on yield attributes yield and economics of chilli (*Capsicum annuum* L.) South Indian Hort. 52: 158–163.

Babu S H, Lokeshwar D, Rao N S & Rao B R B 1998 The response of chili (*Capsicum annuum* L.) plants to early innoculation with mycorrhizal fungi at different levels ofphosphorus. J. Hort. Sci. 63: 315–320.

Gomez K A & Gomez A A 1984 Statistical procedures for Agricultural Research. Second Ed Weily Interscience Publ., John Willey and Sons, New York.

Hegde D M 1997 Nutrient requirements of solanaceous vegetable crops. Food and Fertilizer Technology Center (FFTC), Taiwan.

Johnson D C & Decoteau D R 1996 Nitrogen and potassium fertility affects jalapeno pepper plant growth, fruit yield, and pungency. HortSci. 31: 1119–1123.

Majumdar S P, Meena R L & Baghel G D S 2000 Effect of levels of compaction and potassium on yield and quality of tomato and chilli crop grown on highly permeable soils. J. Indian Soc. Soil Sci. 48: 215–220.

Nagaih K N, Trivedi S K & Rajesh L 1998 Effect of S and potassium fertilization of onion. South Indian Hort. 46: 266–271.

Shafeek M, Nagwa M K, Hassan AG, Beheiry F & Rizk 2012 Productivity of sweet pepper plant (*Capsicum annuum* L.) as affected by different sources of nitrogen and sulphur fertilizers under newly reclaimed soil. J. Appl. Sci. Res. 8: 5365–5371.

Prasad S M, Kumar M H D, Astaputre S A, Chittapur B M, Tatagar M H & Mesta R K 2009 Yield and quality of chilli (cv. *Byadigi dabbi*) as influenced by secondary and micronutrients. Karnataka. J. Agri. Sci. 22: 1090–1092.

Singh H G 1988 Sulphur management in fine textured calcareous soils. In: Proceedings of TSI – FAI Symposium, 9-10 March, New Delhi, p.2–8.

Stroehlein J L & Oebker N F 1979 Effects of nitrogen and phosphorus on yields and tissue analysis of chili peppers. J. American Soc. Hort. Sci. 114: 559–563.