Indian Journal of Agronomy **60** (2): 285–290 (June 2015)

Research Paper

Productivity, profitability and nutrient-use efficiency of baby corn (*Zea mays*) as influenced of varying fertility levels

RAKESH KUMAR[1], J.S. BOHRA[2], AMITESH KUMAR SINGH[3] AND NARENDRA KUMAWAT[4]

Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh 221 005

Received : June 2014; Revised accepted : May 2015

ABSTRACT

A field experiment was conducted at Varanasi during the 2 consecutive pre-*kharif* (rainy) season of 2012 and 2013, to work out the optimum levels of NPKS and Zn application for maximizing the yield, monetary returns and nutrient-use efficiency of baby corn (*Zea mays* L.). Baby cob, baby corn and green fodder yields, economics and nutrient uptake (N, P, K, S and Zn) were significantly higher with application of 125% recommended dose of fertilizer (RDF). Further, application of 50 kg S/ha resulted in significant increase of baby cob, baby corn, green fodder yields, net profit and nutrient uptake (N, P, K, S and Zn) over the control, but it remained at par with 25 kg S/ha. Similar trend were observed with application of zinc levels also. Increasing levels of sulphur and zinc application progressively reduced the agronomic and physiological efficiency and apparent recovery of baby corn. In general, these indices were noted markedly higher with application of 25 kg S/ha and 5 kg Zn/ha than 50 kg S/ha and 10 kg Zn/ha, respectively. However, nutrient-harvest index of N, P, K were decreased gradually with application of increasing levels of NPKS and Zn but reverse in case of S and Zn application. Hence application of 125% RDF along with 50 kg S/ha and 10 kg Zn/ha was found optimum to obtain the maximum baby corn yield, net profit and nutrient-use efficiency under irrigated conditions of Varanasi, Uttar Pradesh.

Key words **:** Baby corn, Fertility levels, Nutrient uptake, Sulphur, Zinc

Baby corn is an immature dehusked, unfertilized maize ear, harvested 1–2 days after silking at 2–3 cm-long silk stage and consumed as vegetables owing to its sweet flavour (Pandey *et al.,* 1998). High-nutritive value, eco-friendly and crispy nature of baby corn has made it a special choice for various traditional and continental dishes apart from canning in the elite society. After harvest of babies, economic potential is further enhanced, since it supplies green, soft, succulent, nutritious, palatable fodder with higher digestibility. Of late, cultivation has started and gaining popularity in peri-urban areas owing to its export potential besides a huge employment generation. Being a short-duration crop (50–60 days), it can be sown and harvested 3–4 times in a year. As rice–wheat system is being practiced for over 40 years in Indo-Gangetic plains and both the crops having similar rooting pattern and foraging, sustainability of system has emerged as a big problem in recent years and need to be diversified (Bohra *et al*., 2007). Baby corn has privilege of its cultivation as a pre-*kharif* (rainy season) in short period; otherwise such lands remain fallow during turn over period of wheat and rice. In Varanasi region of Eastern Uttar Pradesh, baby corn is rather a new introduction particularly as pre-*kharif* crop; so efforts are required to standardize and economize its cultivation. Crop nutrition is an important aspect to achieve the higher yield of baby corn particularly when taken between exhaustive crops like wheat and rice. Singh *et al.* (2010) reported good response of baby corn to higher doses of NPK. However, with increasing doses of NPK, demand for secondary and micro-nutrients also increases correspondingly. Among the secondary and micronutrients, sulphur and zinc are the most limiting in the entire country, in general and Varanasi region in particular. With these facts in view the present study was undertaken.

Based on a part of Ph.D. thesis of the first author, submitted to the Banaras Hindu University, Varanasi in 2013 (unpublished)

[1]**Correspondence Author:** rakeshbhu08@gmail.com
[1]Scientist (Agronomy), ICAR–Research Complex for NEH Region, Nagaland Centre, Jharnapani, Medziphema 797 106; [2]Professor-cum-Senior Agronomist, Department of Agronomy, BHU Varanasi 221 005, Uttar Pradesh; [3]Assistant Professor, Department of Agronomy, RGSC, Barkachchha, BHU, Varanasi, Uttar Pradesh 221 005; [4]SRF, Swami Keshwanand Rajasthan Agricultural University, Beechwal, Bikaner, Rajasthan

MATERIALS AND METHODS

The present investigation was conducted during the pre-*kharif* seasons of 2012 and 2013 at Agricultural Research Farm, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh (25°18' N, 83°03' E, of 78.1 m above mean sea-level). The experimental soil was sandy loam, having *p*H 7.4. It was moderately fertile being low in organic carbon (0.32%). The available N, P, K S and Zn were 190.4, 18.8, 181.8 and 18.3 kg/ha and 0.51 mg/kg soil, respectively. The experiment was laid out in split-plot design with 3 replications. The treatments involved combinations of 2 fertility levels (100% and 125% recommended dose of fertilizer (RDF) and 3 sulphur levels (0, 25 and 50 kg S/ha) in main plots and 3 zinc levels (0, 5 and 10 kg Zn/ha) in sub-plots. The recommended dose of fertilizer (RDF) given to the crop was 150, 75, 60 kg N, P and K/ha. Baby corn hybrid 'HM 4' was sown on 2 May and 17 April in 2012 and 2013 respectively, with seed rate of 40 kg/ha at spacing of 40 cm × 20 cm. The minimum and maximum temperature ranged from 22.1 and 43.3°C in the first year and 20.1 and 40.9°C in the second year, respectively. The crop received total rainfall of 166.6 mm in 2012 and 16.9 mm in 2013 respectively. Nutrients were applied as per treatment and source of N were urea and diammonium phosphate, whereas P, K, S and Zn were applied through diammonium phosphate, muriate of potash, elemental sulphur and zinc oxide respectively. Full doses of P, K, S and Zn and half of N were applied basal and remaining N was top dressed in 2 equal splits at knee high and tassel emergence stage. Sowing was done with pre-sown irrigation during both the years and crop received 3 and 4 post-sowing irrigations in 2012 and 2013, respectively. Gap-filling and thinning were done within 15 days after sowing (DAS) to maintain the optimum plant population. Pre-emergence application of atrazine @ 1.5 kg a.i./ha was applied to control the initial weed flushes followed by mechanical weeding with hand rotary weeder at 25 DAS to remove the weeds in inter-row spaces, whereas weeds falling on rows were removed manually. Detasseling was done immediately after appearance of tassel to avoid the fertilization. Immature baby cobs were harvested within 2–3 days after silk emergence and same were counted, weighed dehusked and baby corn yield was recorded. After the final picking, the crop was harvested for green fodder on 2 July and 17 June in 2012 and 2013, respectively. Gross returns, net returns and benefit: cost ratio were worked out on the basis of prevailing market price of inputs and produce. Nutrient contents, viz. N, P, K, S and Zn of baby corn was determined by following the standard procedures. The uptake of these nutrients was estimated from concentration of nutrients and dry yield of baby corn. The baby corn productivity and crop profitability (economic efficiency) were calculated as:

$$\text{Baby corn productivity (kg/ha/day)} = \frac{\text{Baby corn yield (kg/ha)}}{\text{Total duration of crop (days)}}$$

$$\text{Economic efficiency (₹/ha/day)} = \frac{\text{Net return (₹/ha)}}{\text{Total duration of crop (days)}}$$

The agronomic efficiency (AE), apparent recovery (RE) and physiological use efficiency (PE) of sulphur and zinc were worked out by using the standard formula. Similarly, nutrient harvest index (NHI) was also derived with the help of following formula.

$$\text{NHI (\%)} = \frac{\text{Nutrient accumulated in baby corn (kg/ha)}}{\text{Nutrient accumulated in above ground dry matter (kg/ha)}} \times 100$$

The field data obtained for 2 years were pooled and statistically analysed using the F-test (Gomez and Gomez, 1984). Test of significance of the treatment differences were done on the basis of t-test. The significant difference between treatment means were compared with critical differences at 5% levels of probability.

RESULTS AND DISCUSSION

Yield attributes

Application of 125% RDF significantly improved the yield attributes, viz. number of baby corns/plant, weight of baby cob and baby corn over 100% RDF (Table 1). It seems possible that increasing NPK levels might have provided the better nutrient supply to the baby corn, which improved the growth characters, viz. plant height, number of green leaf and dry matter/plant (data not reported) and consequently enhanced the yield attributes of baby corn. These results are in agreement with the findings of Sobhana *et al*. (2012). The ratio of baby cob : baby corn and cob husk : baby corns were found to increase with increasing the fertility levels but differences did not reach the level of significance. However, barrenness in baby corn reduced significantly with application of 125% RDF over 100% RDF. This could be attributed to the better growth and source–sink relationship at higher rate of fertilizer application. Panwar (2008) also reported that barrenness in baby corn increased with decreased the fertility levels.

Yield attributes, viz. number of baby corns/plant, weight of baby cob and baby corn, increased lucidly with each increment of sulphur application up to the highest level; though 25 and 50 kg S/ha remained comparable (Table 1). Sulphur due to its role in protein and chlorophyll synthesis, its higher rate of application led to greater photosynthate production and vigorous growth. Further, with efficient partitioning of accumulated photosynthates resulted in enhanced yield attributes at higher supplies of sulphur. These results are in conformity with findings of Shivran *et al*. (2013). The ratio of baby cob : baby corn and cob husk : baby corn was found to increase with increasing sulphur levels, but differences did not turn significant. However, number of barren plants per unit area reduced significantly with increasing levels of sulphur application from 0 to 50 kg S/ha.

Increasing levels of zinc application up to 10 kg Zn/ha increased the number of baby corns/plant, weight of baby cob and baby corn weight of baby cob/plant and weight of baby corns/plant, but 5 and 10 kg Zn/ha did not differ significantly (Table 1). Number of barren plants/ha declined significantly with increasing levels of Zn application up to the highest level.

Baby cob, baby corn and fodder yield

Application of 125% RDF significantly increased the yield of baby cob and baby corn over 100% RDF (Table 2). The yield differences in baby cob and baby corn were 19.8 and 20.1% respectively. Increase in baby cob and baby corn yield could be attributed to the favourable effect of higher levels of nutrient application on yield attributes. These results confirm the findings of Singh *et al.* (2010). Similarly, the marked increase in green fodder yield was recorded with application of 125% RDF. This was mainly because of the higher vegetative growth in terms of plant height, number of leaves, leaf-area index (LAI) and dry-matter/plant with increased rate of NPK application. Likewise, baby corn productivity was found significantly higher at 125% RDF over 100% RDF.

Application of 50 kg S/ha being at par with 25 kg S/ha significantly enhanced the baby cob and baby corn yield by 17.1 and 22.8%, respectively, over the control (Table 2). This could be owing to favourable effect of sulphur application on yield attributes, viz. number of baby corns/plant, weight of baby cob and baby corn besides its negative effect on barrenness. The results are in conformity with the findings of Shivran *et al*. (2013). Similarly, as compared to control, application of 25 and 50 kg S/ha increased fodder yield to the tune of 10.8 and 17.3% respectively, but 25 and 50 kg S/ha did not differ significantly. This could be attributed to the direct effect of higher levels of sulphur application on growth parameters, viz. plant height, number of green leaves and dry-matter/plant. Similar results were reported in maize by Bharthi and Poongothai (2008). Baby corn productivity followed the similar trend as that of baby corn yield.

Each successive level of zinc application correspondingly improved the yield of baby cob and baby corn up to the highest level (Table 2) and application of 5 and 10 kg Zn/ha increased the baby cob and baby corn yield to the tune of 7.8, 12.8% and 10.5 and 16.0%, respectively, over control. However, application of 5 and 10 kg Zn/ha did not differ significantly. Similar trend was noticed with respect to baby corn productivity also. This might be owing to positive effect of applied zinc on physiological and meta-

Table 1. Effect of NPKS and Zn application on yield attributes of baby corn (pooled data of 2 years)

Treatment	Baby corns/ plant (Nos.)	Weight of baby cob (g)	Weight of baby corn (g)	Weight of baby corn/ plant (g)	Weight of baby cob/plant (g)	Baby cob: baby corn ratio	Cob husk : baby corn ratio	Barrenness (%)
Fertility level								
100% RDF	2.25	29.8	5.92	14.39	64.75	4.78	3.46	4.03
125% RDF	2.68	35.9	7.08	20.68	92.68	4.82	3.38	3.60
SEm±	0.04	0.71	0.13	0.67	2.32	0.08	0.08	0.07
CD (P=0.05)	0.14	2.22	0.41	2.11	7.30	NS	NS	0.21
Sulphur (kg/ha)								
0	2.20	29.9	5.94	14.15	63.46	4.78	3.25	4.14
25	2.53	33.3	6.58	17.85	81.33	4.81	3.42	3.80
50	2.67	35.6	6.97	20.10	91.36	4.82	3.59	3.51
SEm±	0.06	0.86	0.16	0.82	2.84	0.09	0.10	0.09
CD (P=0.05)	0.17	2.72	0.50	2.58	8.94	NS	NS	0.26
Zinc (kg/ha)								
0	2.27	30.7	6.08	15.00	67.65	4.79	3.29	4.18
5	2.51	33.1	6.56	17.69	80.43	4.80	3.41	3.78
10	2.62	34.8	6.86	19.31	88.07	4.82	3.56	3.49
SEm±	0.05	0.72	0.13	0.68	2.61	0.05	0.09	0.06
CD (P=0.05)	0.13	2.10	0.37	1.97	7.62	NS	NS	0.17

RDF, Recommended dose of fertilizer

bolic process of plants that ultimately enhanced the yield attributes and thereby baby cob and corn yield. Further, application of 10 kg Zn/ha enhanced green fodder yield of baby corn but upper 2 levels remained statistically at par. The favourable effect of zinc application on fodder yield is attributed to overall growth and development under higher supplies of zinc. Mehdi *et al*. (2012) also reported similar results on forage maize. Economic efficiency of baby corn was significantly higher at 125% RDF than 100% RDF; this shows that per day monetary return was more remunerative at higher fertility level.

Interaction

In the present study, fertility levels and zinc interaction (Table 3) was found significant for baby corn and green fodder yield. Combined application of 125% RDF × Zn_{10} resulted in significantly higher baby corn and green fodder yield than the other combinations, but remained at par with 125% RDF × Zn_5. Similarly, with respect to sulphur and zinc interaction (Table 4), S_{50} × Zn_{10} recorded significantly higher baby corn and green fodder yield than the remaining combinations, except S_{50} × Zn_5 and S_{25} × Zn_{10}.

Economics

Application of 125% RDF recorded significantly higher gross return, net returns and benefit: cost ratio than 100% RDF. This could be ascribed to higher yield of baby corn and green fodder at higher rate of NPK fertilization. Similar results of such economic traits of baby corn were reported by Singh *et al.* (2010). Among the levels of sulphur application, gross returns, net returns and benefit: cost ratio were improved correspondingly with each increment of sulphur up to 50 kg S/ha though upper 2 levels remained at par. This was owing to higher baby corn and

Table 2. Effect of NPKS and Zn application on yield and economics of baby corn (pooled data of 2 years)

Treatment	Baby cob yield (t/ha)	Baby corn yield (t/ha)	Green fodder yield (t/ha)	Gross returns (×10³ ₹/ha)	Net returns (×10³ ₹/ha)	Benefit: cost ratio	Economic efficiency (₹/ha/day)	Baby corn productivity (kg/ha/day)
Fertility level								
100% RDF	7.97	1.79	26.25	169.74	112.33	1.95	1985	29.89
125% RDF	9.55	2.15	31.51	202.61	143.40	2.41	2509	35.70
SEm±	0.17	0.04	0.64	3.61	3.58	0.06	65	0.73
CD (P=0.05)	0.55	0.14	2.01	11.37	11.28	0.20	206	2.31
Sulphur (kg/ha)								
0	8.01	1.75	26.40	166.41	109.69	1.92	1941	29.17
25	8.87	2.01	29.26	190.15	131.85	2.25	2316	33.52
50	9.38	2.15	30.97	201.95	142.07	2.36	2485	35.70
SEm±	0.21	0.05	0.78	4.42	4.38	0.08	80	0.90
CD (P=0.05)	0.67	0.17	2.47	13.93	13.81	0.25	252	2.83
Zinc (kg ha)								
0	8.19	1.81	27.01	171.83	114.79	2.00	2027	30.17
5	8.83	2.00	29.13	188.31	130.01	2.22	2286	33.40
10	9.24	2.10	30.49	198.37	138.81	2.32	2429	34.82
SEm±	0.17	0.04	0.62	3.39	3.37	0.06	60	0.64
CD (P=0.05)	0.49	0.12	1.80	10.60	9.83	0.16	175	1.86

RDF, Recommended dose of fertilizer

Table 3. Interaction effect between F × Zn on baby corn yield and green fodder yield (t/ha)

Treatment	Baby corn yield (t/ha)				Green fodder yield (t/ha)			
	Zn (kg/ha)				Zn (kg/ha)			
	0	5	10	Mean	0	5	10	Mean
100% RDF	1.57	1.73	1.84	1.71	23.90	25.81	27.05	25.59
125% RDF	1.90	2.08	2.19	2.06	28.68	30.97	32.41	30.69
Mean	1.73	1.91	2.02	1.89	26.29	28.39	29.73	28.14
		SEm±	CD (P=0.05)			SEm±	CD (P=0.05)	
Fertility at same Zn level		0.07	0.16			1.05	2.51	
Zn at same or different fertility levels		0.06	0.14			0.86	2.22	

green fodder yield at higher levels of sulphur application as well as better market price of the produce. Similarly, with respect to zinc application, 5 and 10 kg Zn/ha though remained comparable registered significantly higher gross returns, net returns and benefit: cost ratio over the control. It is obvious because of favourable effect of zinc application on baby corn and green fodder yield as well as remunerative return in spite of higher cost of cultivation. Mehdi *et al*. (2012) also reported similar results in fodder maize. Economic efficiency of S and Zn application followed the trends that of net returns.

Total nutrient uptake

Application of 125% RDF recorded significantly higher total N, P, K, S and Zn uptake by baby corn than 100% RDF (Table 5). Optimum level of fertilizer application assures availability of nutrients to crops in adequate amounts; hence at 125% RDF, maize cultivated for baby corn produced healthy and more vigorous plants as witnessed by taller plants, more number of active leaf and higher LAI and dry-matter/plant. Such traits accompanied with higher concentration of N, P, K, S and Zn ascertained greater uptake of these nutrients in baby corn. These results are in conformity with the findings of Sobhana *et al*. (2012).

Application of sulphur from 0 to 50 kg S/ha exerted improvement in total N, P, K, S and Zn uptake of baby corn. However, with respect to N and P uptake, application of 25 and 50 kg S/ha did not differ significantly. This could be ascribed to favourable effect of sulphur on growth and yield attributes as well as enhancing the nutrient contents in different plant parts. Similarly, application of zinc from 0 to 10 kg Zn/ha exerted marked variation in total K, S and Zn uptake of baby corn but N and P uptake were recorded significant only up to 5 kg Zn/ha. It has been reported that zinc due to its role in photosynthesis

Table 4. Interaction effect between S × Zn on baby corn yield and green fodder yield (t/ha)

Treatment	Baby corn yield				Green fodder yield			
	Zn (kg/ha)				Zn (kg/ha)			
	0	5	10	Mean	0	5	10	Mean
0	1.52	1.69	1.80	1.67	23.99	25.90	27.18	25.69
25	1.77	1.95	2.07	1.93	26.63	28.75	30.15	28.51
50	1.90	2.08	2.18	2.06	28.24	30.51	31.87	30.21
Mean	1.73	1.91	2.02	1.89	26.29	28.39	29.73	28.14
		SEm±	CD (P=0.05)			SEm±	CD (P=0.05)	
S at same Zn levels		0.08	0.20			1.29	3.08	
Zn at same or different S levels		0.07	0.18			1.05	2.72	

Table 5. Effect of NPKS and Zn application on total nutrient uptake of baby corn (pooled data of 2 years)

Treatment	Total nutrient uptake (kg/ha)				Zn (g/ha)
	N	P	K	S	
Fertility level					
100% RDF	106.2	14.6	122.1	6.2	379
125% RDF	137.8	18.6	151.8	8.0	474
SEm±	3.75	0.49	3.19	0.18	9.3
CD (P=0.05)	11.82	1.54	10.05	0.57	30
Sulphur (kg/ha)					
0	101.3	14.2	117.6	6.0	366
25	126.4	16.9	139.3	7.3	435
50	138.3	18.7	154.0	8.1	478
SEm±	4.59	0.6	3.90	0.22	11.1
CD (P=0.05)	14.48	1.89	12.30	0.70	37.5
Zinc (kg ha)					
0	105.6	14.8	121.9	6.2	378
5	126.7	16.9	139.7	7.3	435
10	133.7	18.1	149.3	7.8	467
SEm±	3.06	0.41	3.09	0.18	10.6
CD (P=0.05)	8.94	1.29	9.02	0.52	30-9

RDF, Recommended dose of fertilizer

Table 6. Effect of NPKS and Zn application on nutrient use efficiency and nutrient harvest index of baby corn (mean data of 2 years)

Treatment	Nutrient use efficiency			Nutrient harvest index (%)				
	Agronomic efficiency (kg baby corn/kg S or Zn applied)	Physiological efficiency (kg baby corn/kg S or Zn uptake)	Apparent recovery (%)	N	P	K	S	Zn
Fertility level								
100% RDF	-	-	-	4.30	6.20	2.42	-	-
125% RDF	-	-	-	4.24	5.88	2.46	-	-
Sulphur levels (kg/ha)								
0	-	-	-	-	-	-	5.52	-
25	10.4	205.2	5.11	-	-	-	5.62	-
50	7.7	189.0	4.11	-	-	-	5.65	-
Zinc levels (kg/ha)								
0	-	-	-	-	-	-	-	1.89
5	35.8	3,197.4	20.2	-	-	-	-	1.91
10	28.8	3,336.8	15.8	-	-	-	-	1.91

RDF, Recommended dose of fertilizer

and metabolic process augment production of photosynthates and their translocation to different plant parts, which ultimately increase the concentration of these nutrients in baby corn. The increase in uptake of these components is combined effect of substantial increase in concentration of these parameters and yield of baby corn under the influence of increasing levels of zinc fertilization. Meena *et al*. (2013) also reported similar results in maize.

Nutrient-use efficiency

Agronomic efficiency, physiological efficiency and apparent recovery were recorded markedly higher at 25 kg S/ha than 50 kg S/ha and except for physiological efficiency (Table 6). Similar trend was noticed between application of 5 and 10 kg Zn/ha. These results clearly indicate that baby corn yield per unit Zn and S applied or uptake as well as Zn and S uptake per unit of respective nutrient applied were more efficiently utilized at lower rate of application. Similarly, the nutrient-harvest index for N, P, K were slightly improved with application of increasing levels of NPKS and Zn, but the reverse trends were followed with S and Zn. This shows that all the nutrients were better translocated to sink than rest of shoot.

Based on the present study, it was concluded that to achieve the maximum yield, monetary return as well as nutrient-use efficiency, baby corn can be grown as pre-*kharif* crop with combined application of 125% RDF (187.5, 93.7, 75 kg N, P and K/ha) and 50 kg S/ha along with 10 kg Zn/ha under irrigated conditions of Varanasi.

REFERENCES

Bharathi, C. and Poongothai, S. 2008. Direct and residual effect of sulphur on growth, nutrient uptake, yield and its use efficiency in maize and subsequent greengram. *Research Journal of Agriculture and Biological Sci*ences **4**(5): 368–72.

Bohra, J.S., Singh, R.K., Singh, U.N., Singh, K. and Singh, R.P. 2007. Effect of crop diversification in rice–wheat cropping system on productivity, economics, land use and energy-use efficiency under irrigated ecosystem of Varanasi. *Oryza* **44**(4): 320–24.

Gomez, K.A. and Gomez, A.A. 1984. *Statistical Procedure for Agricultural Research*, edn 2, pp. 241–71. John Wiley & Sons, New York.

Mehdi, S.S., Hasan, B. and Singh, L. 2012. Influence of seed rate, nitrogen and zinc on fodder maize (*Zea mays* L.) in temperate conditions of Western Himalayas. *Indian Journal of Agronomy* **57**(1): 85–88.

Meena S.K., Mundra, S.L. and Singh P. 2013. Response of maize (*Zea mays* L.) to nitrogen and zinc fertilization. *Indian Journal of Agronomy* **58**(1): 127–28.

Pandey, A.K., Mani, V.P., Singh, R.D. and Chauhan, V.S. 1998. Technologies for baby corn production in hills of North Western Himalayas. *Indian Farming* **48**(4): 10–12.

Panwar, A.S. 2008. Effect of integrated nutrient management in maize (*Zea mays* L.)–mustard (*Brassica campestris* var. *toria*) cropping system in mid-hills altitude. *Indian Journal of Agricultural Sciences* **78**(1): 27–31.

Shivran, R.K., Kumar, R. and Kumari, A. 2013. Influence of sulphur, phosphorus and FYM on yield attributes and productivity of maize in humid south eastern plain of Rajasthan. *Agricultural Science Digest* **33**(1): 9–14.

Singh, M.K., Singh, R.N., Singh, S.P., Yadav, M.K. and Singh, V.K. 2010. Integrated nutrient management for higher yield, quality and profitability of baby corn (*Zea mays* L.). *Indian Journal of Agronomy* **55**(2): 100–04.

Sobhana, V., Kumar, A., Idnani, L.K., Singh, I. and Shiva Dhar. 2012. Plant population and nutrient requirement for baby corn hybrids (*Zea mays*). *Indian Journal of Agronomy* **57**(3): 294–96.