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Response of baby corn based intercropping system as influenced by nitrogen management practices

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Abstract
A field experiment was conducted on a clayey soil of North Eastern Dry Zone of Karnataka during *kharif* 2015 to study the effect of source of nitrogen on yield and economics of baby corn based intercropping systems. The experiment was laid out in split plot design with five main factors and three sub- factors, replicated thrice. Results showed that growth parameters like Plant height, Number of green leaves per plant, Leaf area, Leaf area index and Total dry matter production and among the yield attributes, Cobs plant^{-1}, length of the dehusked cob, cob weight with husk and cob weight without husk was significantly higher with sole baby corn and among nitrogen practices with application of 100% RDN trough chemical fertilizer. Sole baby corn recorded significantly higher green cob yield and green stalk yield among nitrogen practices with application of 100% RDN trough chemical fertilizer.

Keywords: Baby corn, intercropping system, growth and yield

Introduction
Maize (*Zea mays* L.) is a predominant cereal in global agricultural economy. It is used both as food for human and feed for livestock especially in poultry industry. It has got immense yield potential and is therefore called as "miracle crop" and also "queen of cereals". Maize is classified into different groups or types based on the endosperm of kernels among which baby corn is grown for vegetable purpose. Baby corn is a delicious and nutritive vegetable and is consumed as a natural food. It is very tasty, sweet and easy to consume because of its tenderness and sweetness with nutritive value addition. It provides carbohydrates, protein, fat, sugar, minerals and vitamins in palatable, wholesome, hygienic and digestible form. It is rich in phosphorus content (86 mg 100-1 g edible portion in comparison to 21 to 57 mg phosphorus content in other commonly used vegetables). It is a low calorie vegetable having higher fiber content without cholesterol. Besides nutritive advantage, it is also free from residual effect of pesticides as it is harvested within a week of tassel emergence and the young cob is wrapped up tightly with husk and well protected from insects and pests (Pradeep Kumar *et al*., 2004) [6]. With rapid increase in population and less chance of bringing new land under cultivation, intercropping seems to be the only way to increase productivity and intensity land use. This situation warrants developing an appropriate technology of growing cereals in association with vegetables without too much intercrops interference and competition. Presently, the chemical fertilizers are considered as the major source of nutrients. However, the escalating input cost, coupled with increasing usage of chemical fertilizers and depleting soil health necessitates the safe and efficient use of organics in crop production. Application of organic manures in general improves the availability of micro nutrients like zinc, iron, manganese and copper. Hence investigation was carried out to find suitable intercrop with baby corn with best source of nitrogen.

Materials and methods
Field experiment on nitrogen management studies on baby corn based vegetable intercropping systems was carried out to during *kharif* 2015 at IFS farm, University of Agricultural Sciences, Raichur. The rain received during August third week helped for preparation of seedbed. Sowing of crop was taken up on 21st August 2015 after receipt of 35 mm rainfall. The germination was good due to favourable rainfall situation during early stages. Since crop was grown under irrigated condition it did not experience moisture stress throughout its growth period. The temperature and relative humidity were near normal during the growing period. During crop period mean monthly maximum temperature ranged from 31.9°C (November) to 39.1°C (September). While, the mean minimum temperatures ranged from 18.4°C (December) to 23.4°C (September).

The mean relative humidity was highest during the month of September (88%) and the lowest in December (36%). Soil was clayey in texture, organic carbon (0.7%) and available nitrogen (120.0 kg ha^{-1}), available phosphorous (26.0 kg ha^{-1}) and available potassium (285.0 kg ha^{-1}).

The land was ploughed once with mould board plough and then harrowed twice to bring the soil into fine tilth. The experiment was laid out as per the plan. Small bunds were raised around each plot. Experiment was laid down in Split Plot Design with three replications. Main plot treatments includes baby corn + clusterbean (1:1) (M_1), baby corn + okra (1:1) (M_2), baby corn + coriander (1:1) (M_3), baby corn + palak (1:1) (M_4) and sole baby corn (M_5) and sub plot treatments are 100% RDN through chemical fertilizer (S_1), 50% RDN through chemical fertilizer + 25% RDN through goat manure + 25% RDN through poultry manure (S_2) and 50% RDN through goat manure + 50 % RDN through poultry manure (S_3).

The required quantities of poultry manure and goat manure obtained from the livestock components *viz.*, goat, poultry were applied and incorporated in the plots before sowing as per the treatments. Recommended dose of P_2O_5 and K_2O (150: 75: 37.5 kg ha^{-1} respectively) was applied to the soil in the form of single super phosphate and muriate of potash, respectively. And 50 per cent of nitrogen was applied as basal dose at the time of sowing in the form of urea as per the treatments. Remaining 50 per cent of nitrogen was top dressed at 25 DAS through urea as per the treatments. Shallow furrows were opened at 60 cm apart with the help of a marker. The seeds were hand dibbled uniformly on 21-08-2015. Intercrops were sown in between the crop rows of baby corn, and were covered with moist soil immediately after sowing. To control stem borer, phorate (10G granule) was applied in the whorls at 16 DAS and chloropyriphos (2 ml $litre^{-1}$) was sprayed at 30 DAS for control of sucking pest in okra. Hand weeding was done at 15, 35 and 60 days after sowing and no herbicides were used due to different combination. The data recorded on various growth, yield parameters, yield were analysed following standard statistical analysis of variance procedure as suggested Panse and Sukhatme (1967) [5].

Results and discussion

Growth parameter

At harvest significantly higher plant height and number of green leaves per plant (211.0 cm and 11.8) was recorded with sole baby corn (M_5) (Table 1). Intercropping of coriander (M_3) (201.1 cm and 11.3) found significantly on par with sole baby corn (M_5) this is attribute to competition free environment. Among nitrogen management practices significantly higher plant height and number of green leaves per plant (205.0 cm and11.5) was noticed with the application of 100% RDN through chemical fertilizer (S_1). Significantly higher leaf area per plant and leaf area index (63.1 dm^2 and 5.3) was noticed with sole baby corn (M_5) and which was significantly on par with baby corn + coriander (M_3) (61.5 dm^2 and 5.12) and palak (M_4) (61.0 dm^2 and 5.08) this is attributed to leafy vegetables like coriander did not show any adverse effect on growth and development of main crop which may be attributed to the fact that coriander is shallow rooted with short stature and short duration these results are in accordance with Tiwari *et al.* (2002). Significantly lower leaf area per plant and leaf area index (53.7 dm^2 and 4.5) was recorded with baby corn + okra (M_2) which was on par (57.1 dm^2 and 4.7) with baby corn + clusterbean (M_1) intercropping system which might be attributed to vigorous growth put forth by okra crop which affected growth of baby corn by competing for available resources. Significantly higher leaf area per plant and leaf area index (62.4 dm^2 and 5.2) was recorded with the application of 100% RDN through chemical fertilizer (S_1). The reduction in total dry matter production of baby corn was significant when intercropped with okra and clusterbean than with leafy vegetables due to shade created by these crops compared to leafy vegetables *viz.*, palak and coriander respectively. All growth parameters like plant height, leaf area, number of leaves and leaf area index were significantly higher with sole baby corn due to competition free environment for available resource because of lesser population compared to baby corn grown with vegetables. The results are in accordance to those reported by Mandal *et al.* (2014) [4].

Yield parameter

Significantly higher number of cobs per plant was recorded with sole baby corn (M_5) (2.65) (Table 2). In case of different nitrogen management practices application of 100% RDN through chemical fertilizer recorded significantly higher number of cobs per plant (2.64). Sole baby corn (M_5) recorded significantly higher number of cobs per plant cob length (9.3 cm) and it was significantly on par with baby corn + coriander (8.9 cm) and baby corn + palak (8.6 cm). Application of nutrient at 100% RDN through chemical fertilizer (S_1) recorded significantly higher cob length (8.9 cm). Sole baby corn (M_5) recorded significantly higher cob weight with and without husk (148.8 g and 39.1 g) compared to baby corn as an intercrop due to very little competition for the resources due to absence of heterogeneous cropping environment, limited disturbance of habitat (Banik and Sharma, 2009) [2]. Application of 100% RDN through chemical fertilizer (S_1) recorded significantly higher cob weight with and without husk of baby corn (139.5 g and 38.9 g) same results are reported by Leela Rani *et al*. (2011) [3].

Green cob yield (kg ha^{-1}) and Green stalk yield (kg ha^{-1})

Sole baby corn (M_5) recorded significantly higher green cob yield (9322 kg ha^{-1}) (Table 3) which found statistically on par with baby corn + coriander (M_3) (8864 kg ha^{-1}) and baby corn + palak (M_4) (8720 kg ha^{-1}). Higher green cob yield of sole baby corn relative to intercropping treatments attributed to, significantly higher number of cobs per plant, cob length, girth and cob weight. When baby corn intercropped with leafy vegetables *viz.*, coriander and palak, there was reduction of baby corn yield by 4.9 and 6.4 per cent, respectively. Similar results are also reported by Vilhekar *et al*. (2014) [9] in sweet corn based intercropping systems. Compared to clusterbean and okra, there is less reduction of baby corn yield, this might be attributed short duration of leafy vegetables and less competition for available resources. These results are in consonance with the results of Aravinth *et al*. (2011) [1]. Significantly higher green cob yield (8991 kg ha^{-1}) was recorded with the application of 100% RDN through chemical fertilizer (S_1) The increased cob yield in baby corn with application of 100% RDN through chemical fertilizer might be due to inorganic fertilizers have nutrients in available form which would have been easily taken up by the plant for growth and development. Significant differences in the cob yield of baby corn with different nutrient management practices might be attributed to improved growth and yield components *viz.*, total dry matter production and its distribution into different plant parts, cob length, cob girth and cob weight per plant. These results are in accordance with

the Dalvi *et al*. (2009) in sweet corn. Significantly higher green stalk yield (30,722 kg ha^{-1}) was noticed with the sole baby corn (M_5) which found on par (29,840 kg ha^{-1}) with baby corn + coriander (M_3) and baby corn + palak (28,998 kg ha^{-1}) intercropping system (M_4). Application of 100% RDN through chemical fertilizer (S_1) recorded significantly higher green stalk yield (30.016 kg ha^{-1}) Higher green stalk yield in 100% RDN through chemical fertilizer attributed to higher uptake of nitrogen resulted in production of higher number of leaves, taller plant, higher dry matter production and its accumulation. These results are in accordance with the Rajeshwari *et al*. (2007) [7] in grain maize.Harvest index of baby corn were not differed significantly.

Table 1: Growth parameter of baby corn as influenced by intercropping systems and nitrogen management practices at harvest

Treatments	Plant height (cm)	Number of green leaves per plant	Leaf area (dm^2 plant^{-1})	Leaf area index	Total dry matter production
Intercropping system					
M_1: Baby corn + Clusterbean (1:1)	195.7	10.8	57.1	4.75	128.9
M_2: Baby corn + Okra (1:1)	192.1	10.7	53.7	4.47	124.2
M_3: Baby corn + Coriander (1:1)	201.1	11.3	61.5	5.12	145.8
M_4: Baby corn + Palak (1:1)	200.8	11.3	61.0	5.08	140.7
M_5: Sole baby corn	211.0	11.8	63.1	5.26	153.9
S.Em.±	3.1	0.2	1.3	0.11	2.5
C.D. (P=0.05)	10.2	0.7	4.2	0.35	8.1
Nitrogen management practices					
S_1: 100% RDN through chemical fertilizer	205.0	11.5	62.4	5.20	146.1
S_2: 50% RDN through chemical fertilizer + 25% RDN through goat manure + 25% RDN through poultry manure	200.6	11.3	59.7	4.97	139.9
S_3: 50% RDN through goat manure+ 50% RDN through poultry manure	194.9	10.7	55.7	4.64	130.2
S.Em.±	1.6	0.1	0.6	0.05	1.1
C.D. (P=0.05)	4.6	0.4	1.8	0.15	3.2
Interaction					
S.Em.±	4.2	0.3	1.7	0.14	3.2
C.D. (P=0.05)	NS	NS	NS	NS	NS

NS: Non significant, RDN: Recommended dose of nitrogen (150 kg ha^{-1})

Table 2: Yield components of baby corn as influenced by intercropping systems and nitrogen management practices

Treatments	Cobs plant^{-1}	Length of the dehusked cob (cm)	Cob weight with husk (g plant^{-1})	Cob weight without husk (g plant^{-1})
Intercropping systems				
M_1: Baby corn + Clusterbean (1:1)	2.29	7.5	111.6	30.6
M_2: Baby corn + Okra (1:1)	2.29	7.2	109.4	29.4
M_3: Baby corn + Coriander (1:1)	2.54	8.9	130.8	35.3
M_4: Baby corn + Palak (1:1)	2.50	8.6	128.8	33.9
M_5: Sole baby corn	2.65	9.3	148.8	39.1
S.Em.±	0.06	0.3	3.2	1.1
C.D. (P=0.05)	0.18	1.0	10.6	3.7
Nitrogen management practices				
S_1: 100% RDN through chemical fertilizer	2.64	8.9	139.5	38.9
S_2: 50% RDN through chemical fertilizer + 25% RDN through goat manure + 25% RDN through poultry manure	2.50	8.4	129.2	34.8
S_3: 50% RDN through goat manure+ 50% RDN through poultry manure	2.23	7.6	107.0	27.3
S.Em.±	0.04	0.1	2.0	0.8
C.D. (P=0.05)	0.10	0.3	6.1	2.3
Interaction				
S.Em.±	0.09	0.4	4.9	1.8
C.D. (P=0.05)	NS	NS	NS	NS

NS: Non significant, RDN: Recommended dose of nitrogen (150 kg ha^{-1})

Table 3: Green cob yield with husk, green stalk yield, and harvest index of baby corn as influenced by intercropping systems and nitrogen management practices

Treatments	Green cob yield with husk (kg ha^{-1})	Green stalk yield (kg ha^{-1})	Harvest index (%)
Intercropping system			
M_1: Baby corn + Clusterbean (1:1)	8030	27764	22.4
M_2: Baby corn + Okra (1:1)	7933	27294	22.5
M_3: Baby corn + Coriander (1:1)	8864	29840	22.9
M_4: Baby corn + Palak (1:1)	8720	28998	23.1
M_5: Sole baby corn	9322	30722	23.5
S.Em.±	203	531	0.46

C.D. (P=0.05)	661	1732	NS
Nitrogen management practices			
S_1: 100% RDN through chemical fertilizer	8991	30016	23.1
S_2: 50% RDN through chemical fertilizer + 25% RDN through goat manure + 25% RDN through poultry manure	8639	29341	22.8
S_3: 50% RDN through goat manure+ 50% RDN through poultry manure	8092	27415	22.8
S.Em.±	83	292	0.28
C.D. (P=0.05)	246	861	NS
Interaction			
S.Em.±	253	752	0.69
C.D. (P=0.05)	NS	NS	NS

NS: Non significant, RDN: Recommended dose of nitrogen (150 kg ha^{-1})

References

1. Aravinth V, Kuppuswamy G, Ganapathy M. Yield and nutrient uptake by baby corn as influenced by varied population, vermicompost and intercropping with pulses. Crop Res. 2011; 42(1, 2 & 3):82-86.
2. Banik P, Sharma RC. Yield and resource use efficiency in baby corn - legume intercropping system. J. Sus. Agri., 2009; 33:379-395.
3. Leela Rani P, Ramachandra Rao A, Balaswamy K, Riazidduin Ahmed. Effect of organic and inorganic sources of nitrogen on growth, yield and economics of baby corn Zea mays L. Plant Resou. Mgt., 2011, 218-223.
4. Mandal MK, Banerjee M, Banerjee H, Alipatra A, Malik GC. Productivity of maize Zea mays based intercropping system during kharif season under red and lateritic tract of West Bengal. Bioscan. 2014; 9(1):31-35.
5. Panse VG, Sukhatme PV. Statistical methods for agricultural workers, Indian Council of Agricultural Research, New Delhi, 1967.
6. Pradeep Kumar, Yogesh Kumar, Akhilesh Sarraf. Baby corn – A potential crop, Intensive Agric., 2004¸3-9.
7. Rajeshwari RS, Bharamagoudar TD, Pradeep HM. Effect of Integrated Nitrogen Management on Economics of Maize Cultivation. Karnataka J. Agric. Sci. 2007; 20(3):624-625.
8. Tiwari RS, Agarwal A, Senger SC. Effect of intercropping on yield and economics of fennel. Crop Res., 2002; 2:369-74.
9. Vilhekar SC, Badole KK, Ghanbahadur MR. Yield and economics of sweet corn-based cropping systems in rain fed condition. Ann. Plant Soil Res. 2014; 16(4):316-31.