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Growth, yield and economics of baby corn (*Zea mays* L.) as influenced by Integrated Nutrient Management (INM) practices

Ajaz A. Lone*, B. A. Allai and F. A. Nehvi

Karewa Damodor Research Station, Sher-e-Kashmir University of Agricultural Sciences and Technology, Kashmir, Post Box No. 905, GPO Srinagar, Kashmir, Jammu and Kashmir, India.

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Baby corn cultivation can contribute in diversifying cropping pattern. Performance of baby corn variety (VL-78) recommended for north hill zone was evaluated under different fertility levels. The experiment was laid in randomized block design with three replications. Application of farm yard manure (FYM) at 6 T/ha in combination with 150% recommended dose of fertilizer (225N:90P_2O_5:60 K_2O kg/ha) reveled maximum cob yield (without husk) of 20.60 q/ha associated with maximum number of cobs/plot (326). However application of FYM at 6 T/ha in combination with state recommended dose of Nitrogen: Phosphorus: Pottasium (N:P:K) at 90:60:40 kg/ha was statistically at par with the best treatment and gave a cob yield of 19.85 q/ha. Best treatment combination was also associated with maximum Total Soluble Sugars (T.S.S) content (11.20 Brix) in controlled pollinated cobs. Additional application of nutrients did not reveal any significant improvement in morphological characters. Application of 150% of Recommended Dose of Fertilizer (RDF) without FYM reveled increased cob length (10.90 cm), whereas, 125% of RDF resulted in maximum cob girth without husk (18.30 mm). Similar trend of enhanced green fodder yield (26.39 T/ha) was observed with application of 6 T/ha FYM + 150% of RDF). Cultivation of baby corn variety VL-78 under temperate conditions with an application of N:P:K at 90N:60P:40K, kg/ha in combination with 6 T/ha FYM revealed a maximum B:C ratio of 1:1.59.With 703 $/ha as cost of cultivation, the estimated gross returns from the cultivation practice were to the tune of 1825 $ giving a benefit of 1123 $/ha.

Key words: Yield, nutrition, baby corn.

INTRODUCTION

Maize (*Zea mays* L) is the third most important cereal crop next to rice and wheat and has the highest production potential among the cereals. For diversification and value addition of maize as well as growth of food processing industries, recent development is of growing maize for vegetable purpose, which is commonly known as 'baby corn'. It is a small young corn ear harvested at the stage of silk emergence. Young cob corn has been used by Chinese as vegetable for generations and this practice has spread to other Asian countries. It is used as ingredient in most food preparations. It has nutritive value similar to that of non- legume vegetable such as cauliflower

*Corresponding author. E-mail: ajaz999@gmail.com.

tomato, cucumber and cabbage. This vegetable has a great potential for cooking purposes and for processing as a canned product. Canned cob corn export to Thailand, Japan and Europe is increasing and has a good future. Generally, maize farmers strive by improving yields and cutting costs of production, for instance, through shortening cultural risks by harvesting for either green corn or baby corn. Young cob corn has a short growth thus a farmer can grow four or more crop cycles per year. It has a wide range of adaptation and does not need intensive cultivation. Considering these factors, young cob corn has good potentials. Baby corn production, being a recent development has proved an enormously successful venture in countries like Thailand and Taiwan. Attention is now being paid to explore its potential in India, for earning foreign exchange besides higher economic returns to the farmers. Baby corn grows well in a wide range of soil types but it thrives best in loose soil, which drains well. A suitable soil for baby corn has a wide pH range, from 5.5 to 7.0. It can also grow in quite very acid soil, but cannot grow in wetland with low drainage. As for temperature, the plant prefers full sunlight necessary to its growth. Consequently, successful growth requires a minimum average temperature of 72 or 75°F. Nevertheless, when daytime temperature exceeds 85°F, baby corn may be injured, and have to suffer slow growth. The agronomic requirement of babycorn is similar to grain maize except for a suitable variety, plant population density, higher doses of nitrogen and most importantly early harvesting. Yield and quality of baby corn are affected by cultural management applied to the maize plants especially fertilizer application. The different levels of nutrition of maize plants greatly affected the yield and quality (Kunushi et al., 1986). The recent energy crisis and hike in prices of the inorganic fertilizers necessitate the use of organic manures and bio-fertilizers in crop production. In this context an attempt was made to augment baby corn cultivation practice by incorporation of FYM into the normal fertilizer input requirement. This study aims to evaluate the impact of FYM on yield and economics of baby corn cultivation.

MATERIALS AND METHODS

The present study was carried out during Summer 2008 as a part of All India Coordinated Research Improvement Project on Maize at K D Research Station of Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir. The soil of the experimental block was clay loam in texture, neutral in reaction, low in available nitrogen, high in available phosphorus medium in available potassium with normal electrical conductivity. The experiment was laid out in randomized block design with three replications. The plant geometry was maintained at 20×60 cm spacing in each experimental plot. The treatments included in the experiment were T1=No FYM + State recommended dose of NPK, T2 = No FYM + Recommended Dose of Fertilizer (RDF), T3 = No FYM + 125% of RDF. T4 = No FYM + 150% of RDF, T5 = FYM 6 t/ha + State recommended dose of NPK, T6 = FYM 6 t/ha + Recommended Dose of Fertilizer (RDF), T7 = FYM 6 t/ha + 125% of RDF and T8 = FYM 6 t/ha + 150% of RDF. Well decomposed FYM was given to experimental plots at the time land preparation while as full dose of phosphorus and potassium and half dose of nitrogen was applied as basal dose while remaining nitrogen was applied in two equal split applications at knee high stage and pre-tasseling stage. The source of N, P and K were Urea, Diammonium phosphate and Muriate of potash respectively. All the cultural operations were performed as per the package of practices of maize. Observations on morphological traits were recorded for ten randomly selected plants while as Baby corn yield and green fodder yield were recorded on plot basis. The raw data was subjected to appropriate statistical procedure as suggested by Gomez and Gomez (1984).

RESULTS AND DISCUSSION

Significant variation was observed for cob yield without husk among various treatment combinations under investigation. Addition of FYM in the field supplemented by highest dose of fertilizers resulted in maximum cob yield of 2060 kg/ha followed by T7 (2042 kg/ha) and T6 (2010 kg/ha) Table 1. Incremental advances in yield of cobs were observed with the increase in dosage of chemical fertilizers. Cob girth without husk was found to be maximum in T3 (18.30 mm) followed by T8 (16.52 mm) and T7 (15.41 mm). The number of cobs per plot ranged from 286.7 to 326 in all the treatments. Addition of FYM in the experimental plots gave a very positive impetus to the number of pickings in baby corn. Significant effect on green fodder yield was observed with the addition of FYM in the routine chemical fertilizer dosages. Maximum green fodder yield of 263.90 q/ha was observed in T8 and lowest green fodder yield was observed in T2 (193.70 q/ha). T.S.S content in controlled pollinated cobs was found to be maximum in T8 with value of 11.2. More or less T.S.S content remained constant among all treatments with the average T.S.S value of 10.11. Simmilar results were also reported by other research workers like Thavaprakaash et al. (2005), Das et al. (1991), Turget (2000) and Muthukumar et al. (2005).

Impact of FYM on baby corn

The present investigation revealed that there is a tremendous impact of FYM on overall production potential of baby corn. The experimental treatments were subdivided into two sets viz; organic and non organic and subsequently the average effects were calculated which are presented in the form of line bar in Figure 1. The addition of 6 t/ha of FYM resulted in manifold increments in the overall yield of raw baby corn as well as green fodder. Quality parameter T.S.S. at the same time cannot be ignored as T.S.S values were slightly elated by the addition of FYM. Improvement in baby corn yield and related attributes due to incorporation of organic and inorganic nutrient sources can be attributed to balanced

Table 1. Effect of organic manure and inorganic fertilizers on various morphological and yield traits in baby corn.

Treatment	Plant height (cm)	No. of plants per plot	No. of cobs per plot	Cob length without husk (cm)	Cob girth without husk (mm)	Cob yield with husk (Kg/ha)	Cob yield without husk (Kg/ha)	Green fodder yield (q/ha)	T.S.S
T1	178	122.2	286.7	8.71	12.67	6677	1601	206.70	8.53
T2	175	122.2	294.0	8.67	13.37	6951	1692	193.70	9.73
T3	181	122.2	303.3	9.42	18.30	7657	1735	209.40	10.47
T4	191	122.3	306.3	9.69	14.70	8115	1751	216.40	9.80
T5	194	123.3	314.0	10.90	14.31	9377	1985	224.40	9.93
T6	196	123.7	317.3	10.39	15.04	9491	2010	256.60	10.73
T7	198	121.3	321.3	10.13	15.41	9864	2042	255.00	10.53
T8	201	125.3	326.0	10.44	16.52	9835	2060	263.90	11.12
CD (0.005)	7.41	3.81	20.14			1.43	0.25	7.98	1.25

Table 2. Net returns of baby corn cultivation on per hectare basis.

Item	Yield	Approximate rate (Rs)	Gross cost returns (Rs/ha)
Baby corn	1985 (Kg/ha)	45 /kg	89325
Green fodder	224 (q/ha)	50 /q	11200
Total (Rs)			100525
Cost of cultivation (Rs)			40078*
Net returns (Rs)			60447

*The cost of cultivation was calculated as per the local labour and input cost norms.

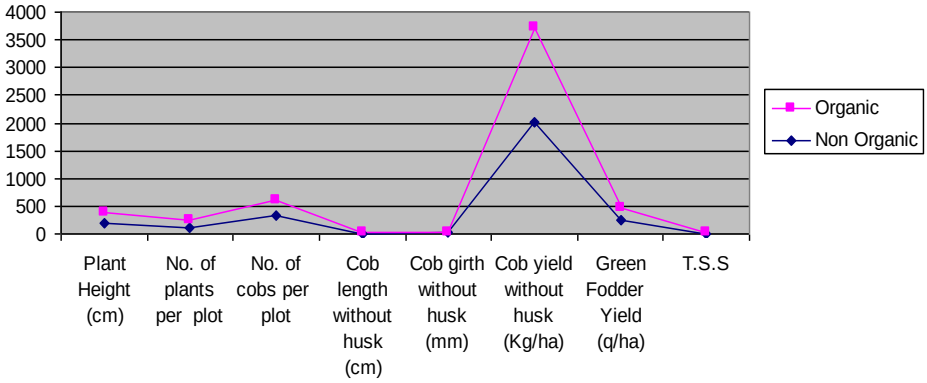

Figure 1. The impact of organic manures on various morphological traits of baby corn.

carbon nitrogen ratio, more organic matter buildup, better root proliferation, sustainable nutrient availability, accelerated transport and higher concentration of plant nutrients. These might have lead to better assimilation of photosynthetates and their efficient translocation from source to sink, resulting in an improvement in overall yield besides having very fruitful effect on soil properties.

Economics of baby corn cultivation

Perusal of Table 2 reveals that the net returns per hectare can be up to the tune of Rs 60,447. The remunerative returns over a period of 85 days in temperate conditions of Kashmir can have a very fruitful impact on the poor farming community. Maximum benefit cost ratio of 1:1.59 was observed in T5, which confirms that only addition of 6 t/ha to the state recommended fertilizer dosage can prove to be very handy in the upliftment of the living standards of the farmers.

The exploitive agriculture for centuries has brought the fertility status of our soils to a level from where for any further increase in the yield cannot be relied upon the native soil fertility. As such, in future, gains in production

levels will accrue through enhancement of productivity which will necessarily mean increased demand on soil fertility. There will be huge demand for organic sources of enriching the soils though chemical fertilizers would continue to play pivotal role in the enrichment of soils and subsequently the production level of crops.

Conclusions

Baby corn cultivation under optimum nutrient input conditions will give a positive impetus to the baby corn cultivation, which in turn shall be very fruitfull in encouraging the livelihood security of poor farming community. Further the short duration life cycle of this crop also enhances the chances of improving the land use pattern of farmers. Further, the tourism oriented nature of states economy is a viable factor for ensuring the unending demand of baby corn.

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