Short communication

Influence of varieties and spacing on yield of dual purpose baby corn (*Zea mays* L.) in summer rice fallows of Kerala

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Abstract

A field experiment was conducted from February to April 2015 at College of Horticulture, Vellanikkara to identify suitable varieties and optimum plant spacing of baby corn (*Zea mays* L.) in summer rice fallows of Kerala, to be used as vegetable and fodder. The treatments included planting of three baby corn varieties viz., G 5414, CO 6 and NSC 1009 B under four different plant densities viz., 60 cm x 15 cm, 50 cm x 15 cm, 40 cm x 15 cm and 30 cm x 15 cm. Green cob and baby corn yield were similar among the varieties, whereas green fodder yield was highest for CO 6 (32 Mg ha^{-1}). Among different spacing levels, 30 x 15 cm spacing gave higher green cob (12.48 Mg ha^{-1}), baby corn (3.22 Mg ha^{-1}) and green fodder yield (34 Mg ha^{-1}). The variety NSC 1009 B was superior in terms of least number of days for tasseling and silking . The variety G 5414 produced highest number of three cobs per plant. The variety CO 6 at 30 x 15 cm resulted in the highest B:C ratio.

Keywords: Baby corn yield, Green cob yield, Green fodder yield, Spacing, Variety

Maize is the third most important cereal crop in India as well as in the world. It has diversified uses as food for humans, feed for livestock and raw material in industries. Maize, being a C4 plant, is an efficient converter of absorbed nutrients into food. A recent development is the use of maize as a vegetable, commonly known as 'baby corn'. In India, it is grown on 9.43 m ha area with the production and productivity of 24.35 m t and 2583 kg $ha^{-1,}$ respectively (Government of India, 2014). Baby corn is the small, young, unfertilized corn ear harvested at the stage of silk emergence (i. e. within 2 - 3 days of silk emergence). In Kerala, most of the rice fields are left uncultivated in the third crop season due to shortage of water. Since baby corn is of short duration (55 - 60 days) and is moderately drought tolerant, it can thrive in the summer rice fallows of Kerala. The benefit with baby corn is that even after the harvest of corn, the total herbage can be utilized as fodder. It generates more nutrition per unit area with the shortest duration and has the potential to be an excellent cash crop. So far, no study has been conducted to find out the suitability of baby corn for cultivation in summer rice fallows of Kerala. Hence, this study was carried out with the objectives of identify suitable varieties and optimum spacing for baby corn cultivation in Kerala.

The experiment was conducted in the experimental farm under the Department of Agronomy, College of Horticulture, Vellanikkara during 2015 - 2016. Geographically, the area is situated at at 13° 32' N latitude and 76° 26' E longitude and an altitude of 40 m above mean sea level. Soil of the experimental site is texturally classified as sandy loam. The soil is acidic in reaction with a pH of 5.4. The soil has a field capacity of 14.6 percent and permanent wilting point 4.6 per cent. The experiment was laid out in Factorial Randomized Block Design (3 x 4) replicated thrice. The plot size was 5 m x 3 m. The treatments consisted of combinations of three baby

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corn varieties viz., G 5414, CO 6 and NSC 1009 B with four different plant densities viz., 60 cm x 15 cm, 50 cm x 15 cm, 40 cm x 15 cm, 30 cm x 15 cm. Primary tillage was done with plough; clods were broken with cultivator, cross harrowed and leveled with leveler. Plots of size 5 m x 3 m were prepared with bunds in between and 60 cm channel between replications. The seeds were soaked in water overnight and dibbled at one seed per hole according to the spacing in the treatments. Before sowing, farm yard manure @ 5 Mg ha^{-1} was applied uniformly to the plots and incorporated. Urea (46% N), Factamphos (20% N, 20% P_2O5_5 and 15% S) and Muriate of potash (60% K_2O) were the fertilizers used for the experiment. Fertilizers were applied as per the recommendations for maize crop (80:40:40 kg N, P_2O_5 and K_2O per ha). The entire quantity of P and half the recommended doses of N and K were applied as basal and the remaining quantity of N and K were top dressed at knee high stage. The first irrigation was given immediately after sowing and later irrigations at three days after sowing to hasten germination, using hose. Subsequently, the field was hose irrigated at 7 - 8 days interval till tasseling stage. Gap filling was done at 10 DAS, keeping a single healthy seedling per hill to maintain an optimum crop stand. Weeding was carried out at 15 DAS using a cono weeder followed by hand weeding at 25 DAS. Chlorpyriphos (400 ml ha^{-1}) was sprayed against stem borer attack. From the net plot of each treatment, five plants were randomly selected. All the biometric observations were taken from these selected plants at 30 and 60 days after sowing. Detasseling is an important and necessary operation in baby corn cultivation. This is to prevent fertilization in cob. Tassels were removed immediately as and when they emerged and before the silk attained 2-3 cm size. From each plot, immature cobs were harvested as soon as the silk reached 2-3 cm length. The cobs were sampled randomly and observations on yield parameters were recorded. The cobs from each plot were weighed and expressed as the cob yield in kg ha^{-1}. The stover was harvested after the final harvest of cobs, weighed and expressed as green fodder yield in Mg ha^{-1}.

Most growth parameters recorded at various growth stages showed favourable influence of different varieties and plant densities (Table 1). Among the varieties, CO 6 produced taller plants (212.74 cm) at harvest stage (60 DAS). The difference in plant height among the varieties is a varietal character. There was almost 25 percent increase in plant height at 40 x 15 cm spacing compared to 60 x 15 cm spacing. Taller plants with high plant population may be due to intra- row plant competition to absorb more solar radiation and other scarce growth

Table 1. Effect of varieties and spacing on growth characters

	Plant height (cm)	Leaf area (cm^2)	LAI	DMP (Mg ha^{-1})	Days to tasseling	Days to silking	Days to 1st harvest	Number of cobs per plant
Varieties								
G 5414	188.6	2,551.3	3.99	6.92	47.92	49.58	50.67	2.58
Co 6	212.7	2,704.6	4.41	7.89	47.08	49.08	50.17	2.00
NSC 1009 B	198.6	2,935.8	4.57	7.14	46.17	48.33	49.67	2.00
$SE_{(m\pm)}$	2.69	116.4	0.14	0.28	0.14	0.14	0.21	0.08
CD	7.95	NS	0.42	NS	0.40	0.41	0.61	0.24
Spacing								
60 x 15 cm	177.2	3161.4	3.51	7.52	47.11	49.11	50.33	2.33
50 x 15 cm	195.4	2676.5	3.57	6.48	47.22	49.11	50.22	2.22
40 x 15 cm	222.3	2595.5	4.32	7.94	46.89	48.89	50.11	2.11
30 x 15 cm	205.1	2488.86	5.53	7.33	47.00	48.89	50.00	2.11
$SE_{(m\pm)}$	3.1	134.4	0.17	0.32	0.16	0.16	0.24	0.09
CD	9.2	396.9	0.49	0.95	NS	NS	NS	NS

Table 2. Effect of varieties and spacing on cob characteristics

Treatments	Cob length (cm)	Cob girth (cm)	Cob weight (g)
Varieties			
G 5414	18.81	8.19	47.30
CO 6	18.77	7.72	47.28
NSC 1009 B	18.25	8.14	47.54
SE(m±)	0.11	0.04	0.28
$CD_{(0.05)}$	NS	0.11	NS
Spacing			
60 x 15 cm	20.40	8.54	52.42
50 x 15 cm	20.77	8.67	53.37
40 x 15 cm	18.07	7.77	46.43
30 x 15 cm	16.04	7.09	37.44
$SE_{(m±)}$	0.13	0.04	0.32
$CD_{(0.05)}$	0.38	0.13	0.95

resources. Dar et al. (2014) also reported increase in plant height with increase in plant population. LAI of NSC 1009 B was on par with CO6. The increase in LAI values resulted from more number of leaves and leaf expansion towards later phases of growth. At 60 day stage, leaf area increased with increased plant spacing and there was 27 per cent increase in leaf area at 60 x15 cm spacing compared to 30 x15 cm spacing. The trend in leaf area index was almost similar to leaf area. The increasing trend observed in leaf canopy cover and leaf area is evidence of good photosynthates assimilation, and consequent higher vegetative growth. LAI was higher for closer planting of 30 x 15 cm. The varieties did not differ significantly with respect to dry matter production and the value ranged 6.92 to 7.89 Mg ha^{-1} at 60 day stage. Among different spacing levels, plant spacing of 40 x 15 cm resulted in higher DMP which was on par with 60 x 15 cm and 30 x 15 cm. Higher DMP at wider spacing can be attributed to more dry matter accumulation per plant at wider spacing, whereas higher DMP at closer spacing may be due to more number of plants per unit area. With respect to days to tasseling and silking, NSC 1009 B took the least number of days (46.1 and 48.3 respectively). Plants of ideal baby corn type should produce corn within 45- 55 days duration. In that aspect, all the three varieties performed similarly. Hence, all the three varieties are ideal for producing baby corn. Up to 30 DAS, the variety NSC 1009 B recorded higher values for growth attributes like maximum dry weight accumulation per plant, plant height and leaf area, and then onwards, partitioning towards baby corn ears. A main reason is shorter vegetative growth period in NSC 1009 B, which takes less days for tasseling, silking. Number of cobs per plant was higher for the variety G 5414. However, number of cobs per plant was non-significant among different spacing levels. Azam et al. (2007) reported that plant spacing had no effect on number of cobs per plant. Significant variation was not observed in green cob yield and baby corn yield among the three varieties (Table 4). Green cob yield and baby corn yield was 43 per cent higher for closer planting of 30 x15 cm compared to wider planting of 60 x15 cm. Marked increase in green cob and baby corn yield appear to be the result of more number of cobs and corn produced per unit area. However, individual cob and corn characteristics were observed to be higher for wider spacing (Table 2 & 3). Sobhana et al. (2012) reported increase in baby corn yield with increase in plant population. The variety CO 6 out yielded the other two varieties in terms of fodder yield.

Table 3. Effect of varieties and spacing on corn characteristics

Treatments	Corn length (cm)	Corn girth (cm)	Corn weight (g)
Varieties			
G 5414	10.75	4.59	16.82
CO 6	10.86	4.65	16.97
NSC 1009 B	10.99	4.70	17.03
SE(m±)	0.10	0.08	0.07
$CD_{(0.05)}$	NS	NS	NS
Spacing			
60 x 15 cm	12.19	5.23	20.50
50 x 15 cm	12.43	5.34	20.81
40 x 15 cm	9.99	4.26	15.65
30 x 15 cm	8.87	3.76	10.80
$SE_{(m±)}$	0.12	0.06	0.08
$CD_{(0.05)}$	0.35	0.18	0.25

Table 4. Effect of varieties and spacing on yield

Treatments	Green cob yield (Mg ha^{-1})	Baby corn yield (Mg ha^{-1})	Green fodder yield (Mg ha^{-1})	Cost of cultivation (Rs)	Gross returns (Rs)	Net returns (Rs)	B:C ratio
Varieties							
G 5414	10.83	2.79	25.48	87134	358692	271558	4.1
CO 6	10.85	2.80	32.29	83310	366454	283144	4.4
NSC 1009 B	10.92	2.82	30.75	84461	367497	283036	4.3
SE(m±)	0.07	0.02	1.49				
$CD_{(0.05)}$	NS	NS	4.39				
Spacing							
60 x 15 cm	8.71	2.25	26.75	82172	275123	192951	3.4
50 x 15 cm	10.67	2.76	27.37	83488	354339	270851	4.3
40 x 15 cm	11.61	3.00	29.82	85462	394133	308671	4.6
30 x 15 cm	12.48	3.22	34.09	88752	433262	344510	4.9
$SE_{(m±)}$	0.09	0.02	1.72				
$CD_{(0.05)}$	0.26	0.07	5.07				

Fodder yield was directly related to its plant height. At 60 day stage, CO 6 produced taller plants (212.74 cm) and G 5414 had the shortest plants (188.63 cm). Kumar et al. (2015) and reported similar observations.

Baby corn cultivation was found to be remunerative. Highest B:C ratio (4.9) was obtained by growing the variety CO 6 and is hence, economically more remunerative. And among the spacing levels, closer planting resulted in higher returns although cost of cultivation was higher (Table 4). This might be due to higher yield resulting from more number of plants per unit area. Hence the variety CO 6 and 30 x 15 cm spacing are economically beneficial.

The experiment revealed the suitability of baby corn for cultivation in summer rice fallows of Kerala. All the three varieties performed similarly with respect to green cob and baby corn yield. However, fodder yield was higher for the variety CO 6, closely followed by NSC 1009 B. All the three varieties performed well in the summer rice fallows of Kerala. Among different spacing levels, closer planting of 30 x 15 cm gave higher green cob yield, baby corn yield and fodder yield. Adoption of closer planting was found to be remunerative.

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