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Effect of crop geometry and intercropping systems on growth parameters and yield of baby corn

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Abstract

A field experiment was carried out during *kharif*, 2015-16 to evaluate the baby corn based intercropping systems under varying crop geometry. The experiment was laidout in split plot design and replicated thrice. The treatments consisted of three crop geometry levels *viz.*, S₁ (45 cm x 20 cm), S₂ (60 cm x 15 cm) and S₃ (90 cm x 10 cm), and four intercropping practices, *viz.*, C₁ (Sole baby corn), C₂ (Baby corn + Coriander), C₃ (Baby corn + Amaranthus) and C₄ (Baby corn + Fenugreek). The results revealed that the growth parameters (*viz.*, plant height, leaf area index and dry matter production), baby corn yield, green fodder yield and harvest index were significantly higher at 60 cm x 15 cm spacing as compared to 45 cm x 20 cm and 90 cm x 10 cm spacings where as, intercropping of baby corn with leafy vegetables did not influence the growth and yield of baby corn.

Keywords: Baby corn, crop geometry, intercrops, baby corn yield and green fodder yield

Introduction

In India there is increased demand for food and nutrition due to increased population. The only way to meet the increased demand for food and nutrition is to raise the productivity of crops per unit area with limited available land and growth resources. Crop combination is necessary to maximize the utilization of growth resources per unit area and to improve the yield as well as to keep the soil in better condition (Shennan, 2008) [6]. Hence, sustainable productivity of crops is the need of the hour in the present Indian farming. So, we must examine every possibility for crop intensification with sustainable nutrition for achieving the sustainability.

Baby corn has the versatility to become commercial crop of this century. Baby corn is gaining popularity as a vegetable being a rich source of phosphorus, iron, vitamin A and C, high fibre content and no cholesterol (Nataraj *et al.*, 2011) [1]. Being a non conventional vegetable crop, it contributes towards employment through value addition and also food processing. Improved technology for baby corn can help to fetch higher economic returns as compared to grain corn. Also, early harvest of corn for baby corn gives nutritious green fodder for livestock. A possible means of increasing the productivity would be through the practice of intercropping.

Baby corn is a short duration crop and enters into reproductive phase at 45 – 50 DAS, until that the resources such as light, space, moisture and nutrients are under utilized. Such less utilized resources could be used effectively by introducing short duration crops which end their life cycle before 45 DAS and not having much effect on main crop are selected to go with baby corn (Thavaprakash *et al.*, 2005a) [3]. Short duration leafy vegetables can be grown in-between the agricultural crops is the recent advancement to fulfill the requirement of leafy vegetables without any reduction of agricultural area and to increase the income of the farmers.

Optimum crop geometry is one of the important factor for higher production by efficient utilization of underground resources (water, nutrients etc.) and also harvesting as much as solar radiation and inturn better photosynthate formation (Rathika *et al.*, 2013) [2].

Space available to the individual plant is important which decides the utilization of soil resources and also harvest of solar radiation, both together, in turn decides the yield of baby corn. Though the spacing requirement of grain and fodder corn has been standardized,

experimental evidence regarding the influence of spacing on green cob and fodder yield that too under intercropping situation and also suitable intercropping system is lacking for Southern Agro cv climatic zone of climatic zone of Andhra Pradesh. Hence this study has been contemplated on baby corn based intercropping system under varying crop geometry.

Material and Methods

The field experiment was conducted during *kharif*, 2015 at S.V. Agricultural college farm, Tirupati. The soil was sandy loam in texture, low in organic carbon (0.28%) and available nitrogen (168 kg ha⁻¹), medium in available phosphorus (22 kg ha⁻¹) and potassium (217 kg ha⁻¹). Baby corn hybrid G-5414, Amaranthus cv. Amaranthus special, Coriander cv. Sindhu, Fenugreek cv. Lam selection-1 were chosen for the study.

The experiment was laid out in split plot design and replicated thrice. The main plots comprised of three levels of crop geometry *viz.*, S₁-45 cm x 20 cm, S₂-60 cm x 15 cm and S₃-90 cm x 10 cm and sub plots consisted of four intercropping practices *viz.*, Sole baby corn (C₁), Baby corn + Coriander (C₂), Baby corn + Amaranthus (C₃) and Baby corn + Fenugreek (C₄). Baby corn sown @ 2 seeds hill⁻¹ and intercrops were sown as solid rows where in amaranthus seeds are mixed with sand in 1:10 ratio. Coriander seeds were rubbed against hard surface, split into two and sown in lines. Uniform dose of 80 kg P₂O₅ and 60 kg K₂O ha⁻¹ through Single super Phosphate and Muriate of potash, respectively were applied as basal to the crop in all the plots. Recommended dose of nitrogen at 250 kg ha⁻¹ in three equal splits *viz.*, basal, 25 DAS and 35 DAS was applied. Due to intercropping, 25 percent more nitrogen than the recommended dose was applied. All the agronomic practices were carried out uniformly to raise the crop.

Results and Discussion

Growth Parameters

Plant Height

Plant height of baby corn measured at harvest was significantly influenced by different crop geometry where as, intercropping did not show any significant influence on plant height of baby corn. The highest plant height was recorded with S₂ (60 cm x 15 cm) which was significantly superior to all other spacings. This was followed by S₁ (45 cm x 20 cm) which was comparable with S₃ (90 cm x 10 cm) which has resulted shortest plants.

As regards the intercropping systems studied, intercrops did not significantly influence the plant height at harvest. However, the tallest plants were recorded with C₁ (Sole baby corn) followed by C₃ (Baby corn + Amaranthus) and the C₂ (Baby corn + Coriander) registered the shortest plants.

Plant height of baby corn tended to increase progressively with the advance in the age of the crop. Taller plants at 60 cm x 15 cm spacing might be due to closer plant to plant space resulted in mutual shading of lower leaves having low light availability, increased root penetration which eventually utilized the growth resources. These findings were in close conformity with those of Thavaprakash *et al.* (2005b) [4]. Eventhough, the crop geometry of 90 cm x 10 cm has closer intra row spacing, the plant height was less due to less nitrogen uptake by the plant as the intercrops offered competition for want of nitrogen during the initial stages.

Plant height of baby corn at all the growth stages did not vary due to intercropping due to short duration and short plant

stature of intercrops. These findings were in close conformity with those of Thavaprakash *et al.* (2005b) [4].

Leaf area index

Leaf area index of baby corn at harvest was significantly influenced by crop geometry, but intercropping did not exert any significant influence on leaf area index. Among different crop geometry levels, the highest leaf area index was recorded with S₂ (60 cm x 15 cm) followed by S₁ (45 cm x 20 cm). The leaf area index was lowest with S₃ (90 cm x 10 cm). The increase in LAI with the crop geometry of 60 cm x 15 cm (S₂) was due to better utilization of available resources must have increased the functional leaves and inturn enhanced the LAI. These findings were in close conformity with those of Thavaprakash *et al.* (2005b) [4]. Eventhough the 90 cm x 10 cm was having closer intra row spacing, the LAI was lowest due to less number of functional leaves.

As regards the intercropping practices tried, intercrops did not significantly influence the leaf area index of baby corn at harvest. However, marginally higher values of leaf area index were recorded with C₁ (Sole baby corn) and C₃ (Baby corn + Amaranthus) due to short plant stature, non-bushiness of intercrops. These findings were in close conformity with those of Thavaprakash *et al.* (2005b) [4].

Dry matter production

Dry matter production of baby corn was significantly influenced by crop geometry where as, intercropping did not exert any significant influence on dry matter production of baby corn. Among different crop geometry levels, the highest dry matter production was recorded with S₂ (60 cm x 15 cm) over S₁ (45 cm x 20 cm) and S₃ (90 cm x 10 cm). This might be due to more plant height and increased LAI together produced higher dry matter production of baby corn. These findings were in close conformity with those of Thavaprakash *et al.* (2005b) [4]. As regards the intercropping practices tried, intercrops did not significantly influenced the dry matter production of baby corn. However, comparatively higher values of dry matter production were recorded with C₁ (Sole baby corn) followed by C₃ (Baby corn + Amaranthus) and the lower values of dry matter production were recorded with C₂ (Baby corn + Coriander). Dry matter production of baby corn at all the growth stages did not differ significantly due to neither complementary nor competitive nature of intercrops. These findings were in close conformity with those of Thavaprakash *et al.* (2005b) [4].

Green cob and fodder yield of baby corn

Crop geometry had a positive influence on green cob and fodder yield of baby corn. Baby corn grown at 60 cm x 15 cm spacing produced higher green cob and fodder yield over 45 cm x 20 cm and 90 cm x 10 cm spacings. The increase in baby corn yield was due to the effective utilization of applied nutrients, increased sink capacity and higher nutrient uptake of baby corn and also attributed to increased growth parameters and yield attributes of baby corn. These findings were in close conformity with those of Thavaprakash and Velayudham (2007) [5].

Intercrops did not significantly influenced the green cob and fodder yield of baby corn. This might be due to short duration, short plant stature, non-bushiness and also neither complementary nor competitive nature of intercrops did not influence the growth and yield parameters of baby corn which reflects on the green cob and fodder yield.

Harvest Index

Harvest index of baby corn did not differ significantly due to different crop geometry levels, intercropping systems as well as by their interactions (Table 1).

Baby corn planted at 90 cm x 10 cm (S₃) spacing registered comparatively the higher harvest index followed by S₂ (60 cm x 15 cm), while the lower values of harvest index were recorded with S₁ (45 cm x 20 cm). This might be due to the equal increase in cob yield corresponding to increase in biological yield. These findings were in close conformity with those of Yogesh *et al.* (2014)^[7].

As regards the intercropping systems tried, marginally higher values of harvest index were recorded with C₂ (Baby corn + Coriander) followed by C₁ (Sole baby corn) and the lower values of harvest index were recorded with C₃ (Baby corn + Amaranthus). This might be due to non significant results obtained with cob yield and green fodder yield of baby corn due to intercropping systems ultimately reflects on the harvest index. Yogesh *et al.* (2014)^[7] also reported the similar results.

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