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# Light Interception and Productivity of Baby Corn as Influenced by Crop Geometry, Intercropping and Topping

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**Field experiments were conducted at the Department of Agronomy, Tamil Nadu Agricultural University, Coimbatore during *kharif*, 2006 and 2007 to study the effect of crop geometry, intercropping and topping on the light interception and productivity of baby corn. Crop geometry (60 x 20 cm and 75 x 16 cm) and intercropping (baby corn alone, baby corn + fenugreek (greens), baby corn + fodder cowpea) were assigned to main plots. Four topping practices (detasseling alone, topping beyond 9th, 10th and 11th internodes) were allotted to sub plots. The results revealed that light interception was more under wider row spacing of 75 x 16 cm than 60 x 20 cm. Intercropping systems intercepted more light than sole cropping during both the years. Topping beyond 9th internode intercepted more light and it was on par with topping beyond 10th internode. Baby corn raised at 75 x 16 cm produced higher green cob yield over 60 x 20 cm. Intercropping systems did not have positive influence on yield of baby corn. The highest green cob yield was obtained with topping beyond 10th internode. Higher baby corn equivalent yield (BEY) was obtained with baby corn + fenugreek grown under 75 cm row spacing combined with topping beyond 10th internode.**

**Key words:** Baby corn, crop geometry, intercropping, topping, light interception, green cob yield

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Baby corn is a potential introductory crop, has the versatility to become commercial crop of this century. To commercialize this new crop, there is an urgent need to find out suitable agro-techniques for higher production and ultimately higher income to the farmers. Maintenance of optimum crop geometry to harvest maximum solar radiation and utilize the soil resources effectively. It is also necessary to select a suitable intercrop with higher productivity and profitability of baby corn in intercropping situation. Growing of short duration leguminous crops like fodder cowpea (Purushotham *et al*., 2003) and fenugreek (Kumar *et al*., 2006) as intercrops in various cereals and millets have been well documented for its higher system productivity. Topping is an important agro-technique to induce better cob development by removal of terminal portion from the uppermost node. However, it is essential to know the correct stage of the crop when nipping has to be done. But, information on these aspects in baby corn is lacking, hence this study.

## Materials and Methods

Field experiments were conducted at Eastern Block Farm, Tamil Nadu Agricultural University, Coimbatore during *kharif* 2006 and 2007. The experiments were laid out in split plot design with three replications.The main plot treatments comprised of crop geometry (60 x 20 cm and 75 x 16 cm) and intercropping systems (baby corn alone, baby corn + fenugreek (greens), baby corn + fodder cowpea). Topping practices (detasseling alone, topping beyond $9_{th}$, $10_{th}$ and $11_{th}$ internodes) were assigned to sub plots. Detasseling was done as and when the tassel emerged i.e., normally at 52-55 DAS. Topping refers to nipping or the removal of terminal portion from the uppermost node to induce better cob development and to avoid fertilization of the cob. Topping beyond $9_{th}$, $10_{th}$ and $11_{th}$ internodes were done at 47, 50 and 52-55 DAS, respectively.

The soil of the experimental field was sandy clay loam in texture belonging Typic Ustochrepts with alkaline pH; low in organic carbon (0.35 and 0.39%) and available nitrogen (232.5 and 242.6 kg $ha_{-1}$), medium in available phosphorus (14.2 and 16.5 kg $ha_{-1}$) and high in potassium (470.0 and 446.8 kg $ha_{-1}$) during both the years, respectively. The baby corn composite COBC 1, CO 2 of fenugreek (greens) and CO(FC) 8 of fodder cowpea varieties were used in this study.

The measurement of light was done between 1200 and 1300 hours of the day using 1 m line quantum sensor (LICOR Model LI - 185 A). Light incident above the canopy and transmitted through the canopy were measured. Mean transmitted light was calculated by taking observations along rows and across the rows. The percentage of light intercepted by the crop canopies of the cropping systems was calculated as follows.

$$PLI = \frac{(LI - LT)}{LI} X 100$$

Where,

PLI - Percentage of light intercepted

LI - Light incident above the crop canopies and

LT - Light transmitted below the crop canopies

The green cob yield was recorded as (kg $ha^{-1}$). Baby corn equivalent yield (BEY) was worked out based on the formulae evolved by Verma and Modgal (1983).

## Results and Discussion

### *Light interception*

Light interception was significantly influenced by the crop geometry, intercropping and topping practices (Table 1).Wider row spacing (75 cm) recorded higher light interception than closer spacing (60 cm) in all the observations. The increased light interception might be due to increased growth parameters of both baby corn and intercrops. This corroborates with the findings of Maddonni *et al.* (2006) in maize.

Both the intercrops intercepted more light than sole crop during both the years. Among the intercrops, fenugreek at 25 DAS and fodder cowpea at 45 DAS showed maximum light interception. The increased light interception was due to the better growth of intercrops. The present results are in consonance with the findings of Faris *et al.* (1993) in maize + fodder cowpea intercropping system.

Topping practices had no significant effect on light interception of baby corn based intercropping system at 25 and 45 DAS. However, at later stages, the light interception was significantly influenced by topping treatments. Topping beyond $9^{th}$ internode intercepted more light and it was on par with topping beyond $10^{th}$ internode at 60 DAS and harvest stages.The increased light interception was due to arresting the unnecessary growth and decreasing mutual shading of leaves, which in turn resulted in greater functioning of leaves and availability of more space for increased penetration of light to the lower canopy. Similar results were also reported by Pearson *et al.* (1984) in maize. The light interception was lower with detasseling alone in all the stages of observation.

**Table 1. Light interception (%) of baby corn as influenced by crop geometry, intercropping & topping practices**

| Treatment | 2006 | | | | 2007 | | | |
|---|---|---|---|---|---|---|---|---|
| | 25 DAS | 45 DAS | 60 DAS | Harvest | 25 DAS | 45 DAS | 60 DAS | Harvest |
| Crop geometry | | | | | | | | |
| $S_1$ – 60 x 20 cm | 28.3 | 48.3 | 60.5 | 40.6 | 25.2 | 42.6 | 55.6 | 35.3 |
| $S_2$ – 75 x 16 cm | 31.6 | 50.8 | 64.8 | 43.9 | 28.4 | 46.2 | 59.3 | 38.9 |
| SEd | 0.3 | 0.4 | 0.5 | 0.3 | 0.2 | 0.3 | 0.4 | 0.3 |
| CD (P=0.05) | 0.6 | 0.9 | 1.0 | 0.7 | 0.5 | 0.7 | 0.8 | 0.6 |
| Intercropping systems | | | | | | | | |
| $C_1$ – Sole baby corn | 26.4 | 47.6 | 62.5 | 42.1 | 23.5 | 43.5 | 57.4 | 37.2 |
| $C_2$ – Baby corn + fenugreek (greens) | 32.8 | 49.2 | 63.0 | 42.3 | 29.0 | 44.0 | 57.6 | 37.0 |
| $C_3$ – Baby corn + fodder cowpea | 30.6 | 52.0 | 62.6 | 42.5 | 27.9 | 45.6 | 57.3 | 37.0 |
| SEd | 0.3 | 0.5 | 0.6 | 0.4 | 0.3 | 0.5 | 0.5 | 0.4 |
| CD (P=0.05) | 0.7 | 1.0 | NS | NS | 0.6 | 1.0 | NS | NS |
| Topping practices | | | | | | | | |
| $T_1$ – Detasseling alone | 30.0 | 50.0 | 60.2 | 39.4 | 26.6 | 44.2 | 55.0 | 34.6 |
| $T_2$ – Topping beyond $9^{th}$ internode | 29.6 | 49.3 | 65.0 | 44.6 | 27.0 | 44.5 | 60.1 | 39.5 |
| $T_3$ – Topping beyond $10^{th}$ internode | 29.8 | 49.3 | 64.5 | 43.5 | 26.7 | 44.0 | 59.4 | 39.0 |
| $T_4$ – Topping beyond $11^{th}$ internode | 30.2 | 49.6 | 61.1 | 41.6 | 26.9 | 44.7 | 55.5 | 35.2 |
| SEd | 0.6 | 0.8 | 1.0 | 0.7 | 0.4 | 0.7 | 0.7 | 0.6 |
| CD (P=0.05) | NS | NS | 2.0 | 1.4 | NS | NS | 1.5 | 1.2 |

Interaction is not significant

### *Green cob yield*

Crop geometry had a positive influence on green cob yield of baby corn (Table 2). Baby corn grown at wider row (75 x 16 cm) spacing produced 7.0 and 6.3 per cent higher cob yield over narrow row (60 x 20 cm) spacing during 2006 and 2007, respectively. Pooled analysis showed that wider row spacing recorded 6.7 per cent higher green cob yield than narrow row spacing. This increase in yield was probably due to effective utilization of applied nutrients, increased sink capacity and nutrient uptake by the crop. This corroborates with the findings of and Maddonni *et al.* (2006) in maize.

There was no significant response on cob yield of baby corn due to intercropping systems. This might be due to short duration, short plant stature, non-bushiness and also non competitive nature of intercrops which did not affect the growth parameters of main crop. Similar results have been reported earlier by Tiwari *et al*., (2002).

Among the topping treatments, topping beyond $10^{th}$ internode produced significantly higher green cob yield as compared to topping beyond $9^{th}$ internode. The lowest green cob yield was registered with detasseling alone. Topping beyond $10^{th}$ internode recorded 11.8 and 12.8 per cent higher cob yield during 2006 and 2007, respectively over detasseling alone. Based on pooled analysis, the yield increase due to topping beyond $10^{th}$ and $9^{th}$ internode over detasseling alone was 12.3 and 9.6 per cent, respectively. The possible reasons for this enhanced yield might be due to greater functioning of remaining leaves by arresting unnecessary growth, decreased mutual shading of leaves and higher light interception leading to increased photosynthesis and $CO_2$ exchange rate, nutrient uptake, decreased competition between the tassel and ear for available plant nutrients, diverting plant nutrients to the reproductive part which aids in better source-sink relationship and better cob development. The present results are in agreement

**Table 2. Influence of crop geometry, intercropping and topping practices on green cob yield and baby corn equivalent yield (BEY)**

| Treatment | Green cob yield (kg ha-1) | | | BEY (kg ha-1) | | |
|---|---|---|---|---|---|---|
| | 2006 | 2007 | Pooled | 2006 | 2007 | Pooled |
| Crop geometry | | | | | | |
| $S_1$ - 60 x 20 cm | 7270 | 6566 | 6918 | 8534 | 7762 | 8118 |
| $S_2$ - 75 x 16 cm | 7777 | 6980 | 7379 | 8918 | 7969 | 8494 |
| SEd | 137 | 111 | 118 | 115 | 102 | 121 |
| CD (P=0.05) | 274 | 223 | 236 | 230 | 204 | 243 |
| Intercropping systems | | | | | | |
| $C_1$ - Baby corn alone | 7578 | 6788 | 7183 | 7638 | 6863 | 7251 |
| $C_2$ - Baby corn + fenugreek (greens) | 7610 | 6847 | 7229 | 10564 | 9457 | 10011 |
| $C_3$ - Baby corn + fodder cowpea | 7383 | 6683 | 7033 | 7976 | 7177 | 7577 |
| SEd | 163 | 135 | 140 | 132 | 116 | 141 |
| CD (P=0.05) | NS | NS | NS | 264 | 232 | 283 |
| Topping practices | | | | | | |
| $T_1$ - Detasseling alone | 7109 | 6370 | 6740 | 8446 | 7592 | 8019 |
| $T_2$ - Beyond 9th internode | 7756 | 7018 | 7387 | 4909 | 8019 | 8464 |
| $T_3$ - Beyond 10th internode | 7951 | 7183 | 7567 | 8993 | 8090 | 8542 |
| $T_4$ - Beyond 11th internode | 7256 | 6520 | 6888 | 8555 | 7651 | 8103 |
| SEd | 223 | 205 | 212 | 168 | 155 | 174 |
| CD (P=0.05) | 457 | 416 | 435 | 336 | 312 | 348 |

Interaction is not significant

with the findings of Esechie and Al-Alawi (2002) in maize.

***Baby corn equivalent yield (BEY)***

Higher BEY was obtained in wider row (76 x 16 cm) than narrow row (60 x 20 cm) crop geometry (Table 2). Pooled mean was also in the similar trend. Wider row spacing recorded 4.0 per cent increased BEY when compared to narrow row spaced baby corn. This is in conformity with the results of Thavaprakaash *et al.* (2005) in baby corn + *Amaranthus* intercropping system.

Among the intercropping systems, baby corn + fenugreek registered higher BEY than baby corn + fodder cowpea intercropping system during both the years. Pooled analysis showed that baby corn intercropped with fenugreek recorded 38.1 per cent higher BEY over sole baby corn. This could be justified that additional yield obtained from the intercrops and higher market value for fenugreek. The findings of Kumar and Singh (2002) who reported that the maize grain equivalent yield was the highest with maize + fenugreek intercropping over sole maize and support to the present findings.

Topping beyond 10th and 9th internode recorded significantly higher BEY over topping beyond 11th internode and detasseling alone. Pooled analysis also showed similar trend. Enhanced light interception, photosynthetic efficiency, nutrient uptake and source-sink relationship due to topping beyond 10th and 9th internode would have resulted in higher yield of baby corn and non reduction of yield of intercrops.

## Conclusion

The study revealed that raising of baby corn at wider row spacing (75 x 16 cm), growing of fenugreek as an intercrop and topping of baby corn beyond 10th internode intercepted more light, produced higher green cob yield and baby corn equivalent yield.

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