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# Pigeonpea - sesame intercropping systems for sustained production in northern transition zone of Karnataka

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The world population is increasing at an alarming rate and is expected to reach 8.9 billion by the year 2025. To meet the ever increasing demand for food we have to produce 50 per cent more from the present day production level. Hence there is a need to search ways and means to augment the production of food and the one such way is intercropping system. Recently there has been a rapid growing interest in adopting the intercropping system as a most potential tool for enhancing the crop production especially in developing countries.

Pigeonpea is second most important pulse crop of India. It is cultivated as a sole crop in Northern Karnataka with wider planting geometries. This wider planting geometry gives a scope of introducing short duration intercrops to increase the productivity of the system besides efficient utilization of natural resources. Further, the rainfall received during rainy season is more than adequate for single crop but less than adequate for double cropping. In case of pigeonpea, the vegetative growth in the initial stages is very slow, therefore the intercrop should be such that it would complete its grand growth period before the normal vegetative growth of pigeonpea.

Sesame is one of the important oilseed crop of India since ages, but the productivity was low since it is mostly grown under rainfed conditions without much applied inputs. Sowing sesame as an intercrop with pigeonpea may fulfill this requirement as the growth habit of sesame is mostly suited for modification in the planting systems.

Since, pigeonpea is known for plasticity, efforts are made to grow different sesame cultivars in different row proportions as an intercrop with pigeonpea for obtaining higher yield and returns per unit area by efficient utilization of moisture and solar radiationenergy.

The experiment was conducted at Main Agricultural Research Station, Dharwad during the *kharif* and *rabi* seasons of 2005-06. The soil of the experimental site was black clayey with pH 7.6, EC 0.3 dS $m^{-1}$, organic carbon 0.59 per cent and available N, $P_2O_5$ and $K_2O$ 256, 34.8 and 256.3 kg/ha respectively. Fifteen treatment combinations (Table 1) were laid out in randomized complete block design with three replications. Gross plot area was 4.2 m × 6.3 m and net plot area varies with row proportions (Table 3). Plant population of pigeonpea in all the inter cropped treatments were maintained equally (100 %) by adjusting intra row spacing (additive series) while sesame plant populations were maintained at 50, 66.6 and 75 per cent in 1:1, 1:2 and 1:3 row proportions, respectively. Recommended dose of fertilizer was applied to sesame in sole and pigeonpea in all the treatments, while intercropped sesame received fertilizer on area basis. Both the crops were sown on July 3rd, 2005, whereas sesame cultivars were harvested on 3rd and 8th October, 2005 and pigeonpea was harvested on 9th January, 2006. The rainfall received during the crop growth period was 1011 mm and it was fairly well distributed throughout the cropping period.

The seed yield of pigeonpea differed significantly due to intercropping of sesame (Table 1). Significantly higher seed yield (1919 kg/ha) was recorded with sole pigeonpea grown with wider planting geometry of 120 x 15 cm compared to other planting geometries (60 x 30 cm and 90 x 20 cm) either in sole or intercropping system. Among the intercropping situations, higher seed yield (1476 kg/ha) was recorded with wider planting geometry (120 x 15 cm) pigeonpea with sesame in 1:3 row ratio over other treatments. Sesame seed yield followed the same trend as that of pigeonpea while sole sesame (cv. DS-1) recorded significantly higher seed yield (692 kg/ha) than other two genotypes (E-8 and Kanakapura local) in sole as well as intercropping system. In intercropped situation, sesame cultivar DS-1 grown with pigeonpea in wider planting geometry (120 x 15 cm) and 90 x 20 cm recorded next higher seed yield (591 and 530 kg/ha) which was 17.0 and 30.5 per cent lower than sole sesame (cv. DS-1). ) respectively. The higher seed yield of both the crops in the aforesaid treatments was attributed to higher total dry matter production, leaf area index, number of pods/capsules and seed weight per plant. In contrast to seed yields of both crops, the pigeonpea equivalent yield (PEY) of the system revealed higher equivalent yield (2414 kg/ha) with pigeonpea + sesame (cv. DS-1) in 1:3 row proportion with wider planting geometry (120 x 15 cm) than other intercropping treatments. Similar results were also reported by Jain *et al.*

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(2001), Hosmath and Patil (1999), Sharma *et al.* (1998). The efficiency of the system in land use (LER) and with relation to time (ATER) was significantly higher in pigeonpea + sesame (irrespective of cultivars) in 1:3 row proportion.

The economics of the system revealed that the pigeonpea (120 x 15 cm) + sesame (cv. DS-1) in 1:3 row proportion was most profitable in terms of gross returns (Rs. 43109/ha) and net returns (Rs. 27362/ha) followed by pigeonpea + sesame (cv. DS-1) in 1:2 row proportion with 90 x 20 cm planting geometry. Maximum B:C ratio was realized with sole pigeonpea (3.13) with wider planting geometry of 120 cm × 15 cm. Among intercropping treatments maximum B:C ratio was realized in pigeonpea + sesame (cv. DS-1) in 1:3 row ratio (2.73) and 1:2 row ratio (2.65).

## REFERENCES

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**Table 1: influence of intercropping on yield and yield attributing parameters of pigeonpea and sesame**

| Treatments | TDMP (g/plant) | | LAI | | No. of pods/ capsules | | Seed weight (g/plant) | | Seed yield (kg/ha) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **PP** | **SM** | **PP** | **SM** | **PP** | **SM** | **PP** | **SM** | **PP** | **SM** |
| PP (60 cm x 30 cm) + SM (cv. DS-1) in 1:1 RP | 117.9 | 20.27 | 0.310 | 0.80 | 78 | 43.50 | 25.33 | 3.96 | 1310 | 355 |
| PP (60 cm x 30 cm) + SM (cv. E-8) in 1:1 RP | 112.1 | 17.31 | 0.273 | 0.74 | 70 | 39.10 | 23.40 | 2.79 | 1206 | 305 |
| PP (60 cm x 30 cm) + SM (cv. KPL) in 1:1 RP | 116.3 | 12.36 | 0.287 | 0.55 | 80 | 33.00 | 24.76 | 2.36 | 1230 | 265 |
| PP (90 cm x 20 cm) + SM (cv. DS-1) in 1:2 RP | 126.6 | 20.77 | 0.323 | 0.98 | 80 | 42.60 | 26.96 | 3.96 | 1412 | 530 |
| PP (90 cm x 20 cm) + SM (cv. E-8) in 1:2 RP | 121.6 | 17.47 | 0.303 | 0.74 | 72 | 39.43 | 24.70 | 2.82 | 1366 | 457 |
| PP (90 cm x 20 cm) + SM (cv. KPL) in 1:2 RP | 128.8 | 12.49 | 0.310 | 0.51 | 82 | 33.33 | 26.36 | 2.40 | 1402 | 360 |
| PP (120 cm x 15 cm) + SM (cv DS-1) in 1:3 RP | 129.7 | 20.87 | 0.337 | 0.96 | 85 | 43.93 | 29.33 | 3.99 | 1468 | 591 |
| PP (120 cm x 15 cm) + SM (cv. E-8) in 1:3 RP | 125.2 | 17.56 | 0.317 | 0.75 | 81 | 38.76 | 28.00 | 2.82 | 1423 | 478 |
| PP (120 cm x 15 cm) + SM (cv. KPL) in 1:3 RP | 131.4 | 13.09 | 0.333 | 0.54 | 83 | 32.56 | 29.11 | 2.37 | 1476 | 434 |
| Sole PP (cv. Maruti) – 60 cm x 30 cm | 157.1 | - | 0.430 | - | 101 | - | 33.44 | - | 1635 | - |
| Sole PP (cv. Maruti) – 90 cm x 20 cm | 181.5 | - | 0.527 | - | 130 | - | 41.26 | - | 1776 | - |
| Sole PP (cv. Maruti) – 120 cm x 15 cm | 202.2 | - | 0.633 | - | 158 | - | 52.49 | - | 1919 | - |
| Sole SM (cv. DS-1) | - | 20.42 | - | 1.01 | - | 45.16 | - | 4.02 | - | 692 |
| Sole SM (cv. E-8) | - | 18.27 | - | 0.80 | - | 39.76 | - | 2.92 | - | 520 |
| Sole SM (cv. Kanakapura local) | - | 13.48 | - | 0.60 | - | 33.33 | - | 2.47 | - | 467 |
| **S.Em ±** | **4.23** | **0.32** | **0.031** | **0.05** | **3.50** | **1.24** | **0.78** | **0.07** | **37** | **12** |
| **LSD(P=0.05)** | **12.41** | **1.00** | **0.090** | **0.17** | **10.26** | **3.64** | **2.30** | **0.20** | **109** | **36** |

PP – Pigeonpea, SM – Sesame, RP – Row proportion, LAI- Leaf area index, TDMP- Total drymatter production

**Table 2: Intercropping of pigeonpea with sesame cultivars under varied planting geometries and row proportions**

| Treatments | Net plot size ($m^2$) | | LER | ATER | PEY (kg/ha) | Gross returns (Rs./ha) | Net returns (Rs./ha) | B : C ratio |
|---|---|---|---|---|---|---|---|---|
| | Pigeonpea | Sesame | | | | | | |
| PP (60 cm x 30 cm) + SM (cv. DS-1) in 1:1 RP | 10.80 (6) | 13.68 (6) | 1.26 | 1.06 | 1877 | 33605 | 19440 | 2.36 |
| PP (60 cm x 30 cm) + SM (cv. E-8) in 1:1 RP | 10.80 (6) | 13.68 (6) | 1.30 | 1.04 | 1694 | 30346 | 16181 | 2.13 |
| PP (60 cm x 30 cm) + SM (cv. KPL) in 1:1 RP | 10.80 (6) | 13.68 (6) | 1.30 | 1.01 | 1654 | 29651 | 15486 | 2.09 |
| PP (90 cm x 20 cm) + SM (cv. DS-1) in 1:2 RP | 9.18 (3) | 6.84 (2) | 1.50 | 1.21 | 2261 | 40381 | 25162 | 2.65 |
| PP (90 cm x 20 cm) + SM (cv. E-8) in 1:2 RP | 9.18 (3) | 6.84 (2) | 1.60 | 1.23 | 2098 | 37474 | 22255 | 2.45 |
| PP (90 cm x 20 cm) + SM (cv. KPL) in 1:2 RP | 9.18 (3) | 6.84 (2) | 1.53 | 1.15 | 1978 | 35405 | 20186 | 2.32 |
| PP (120 cm x 15 cm) + SM (cv DS-1) in 1:3 RP | 8.64 (2) | 4.56 (1) | 1.60 | 1.21 | 2414 | 43109 | 27362 | 2.73 |
| PP (120 cm x 15 cm) + SM (cv. E-8) in 1:3 RP | 8.64 (2) | 4.56 (1) | 1.63 | 1.22 | 2189 | 39120 | 23373 | 2.48 |
| PP (120 cm x 15 cm) + SM (cv. KPL) in 1:3 RP | 8.64 (2) | 4.56 (1) | 1.66 | 1.20 | 2171 | 38843 | 23096 | 2.46 |
| Sole PP (cv. Maruti) – 60 cm x 30 cm | 10.08 (6) | - | 1.0 | 1.0 | 1635 | 29519 | 18519 | 2.68 |
| Sole PP (cv. Maruti) – 90 cm x 20 cm | 9.18 (3) | - | 1.0 | 1.0 | 1776 | 32004 | 21004 | 2.90 |
| Sole PP (cv. Maruti) – 120 cm x 15 cm | 8.64 (2) | - | 1.0 | 1.0 | 1919 | 34535 | 23535 | 3.13 |
| Sole SM (cv. DS-1) | - | 19.38 (17) | 1.0 | 1.0 | 1107 | 19385 | 10885 | 2.27 |
| Sole SM (cv. E-8) | - | 19.38 (17) | 1.0 | 1.0 | 832 | 14560 | 6060 | 1.71 |
| Sole SM (cv. Kanakapura local) | - | 19.38 (17) | 1.0 | 1.0 | 747 | 13085 | 4585 | 1.53 |
| **S.Em ±** | - | - | 0.04 | 0.02 | 41 | 709 | 709 | 0.05 |
| **LSD (P=0.05)** | - | - | 0.10 | 0.06 | 118 | 2056 | 2057 | 0.14 |

PP – Pigeonpea SM – Sesame LER – Land equivalent ratio ATER – Area time equivalent ratio
PEY – Pigeonpea equivalent yield TDMP- Total drymatter production Price of pigeonpea – Rs. 17.5/kg
Price of sesame – Rs. 28.0/kg , Values in parenthesis indicate no. of sets harvested.