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Economics of transplanted pigeonpea in sole cropping and finger millet based intercropping system

D.S. POORNIMA, B.C. SHANKARALINGAPPA, K.N. KALYANA MURTHY* AND H.R. SAVITHA[1]
Department of Agronomy, College of Agriculture, University of Agricultural Sciences, G.K.V.K., BENGALURU (KARNATAKA) INDIA

ABSTRACT

A field experiment was carried out at the Gandhi Krishi Vignana Kendra, Bengaluru under rainfed conditions during *Kharif,* 2008 to workout the economics of sole crop of transplanted pigeonpea and finger millet + transplanted pigeonpea intercropping. Transplanting of 5 weeks old pigeonpea seedlings as sole crop resulted in significantly 69.5 per cent higher grain yield (2669 kg ha^{-1}) over direct sowing (1575 kg ha^{-1}), higher net returns of Rs. 39983 ha^{-1} with B:C ratio of 1.99 than direct sowing (Rs. 21817 ha^{-1} with B:C ratio of 1.77). Finger millet + transplanted pigeonpea (8:2) intercropping with transplanting of 4 weeks old seedlings produced significantly higher pigeonpea grain yield (1347 kg ha^{-1} with finger millet grain yield of 1880 kg ha^{-1}) compared to finger millet + direct sown pigeonpea (391 kg ha^{-1} with finger millet grain yield of 1992 kg ha^{-1}). Finger millet + transplanted pigeonpea (8:2) with 4 weeks old seedlings gave higher net returns (Rs. 31874 ha^{-1}) and B:C ratio of 1.90 than finger millet + direct sown pigeonpea (Rs. 16176 ha^{-1} and 1.28, respectively) and sole crop of finger millet (net returns of Rs. 14910 ha^{-1} and B:C ratio of 1.64).

Key words : Pigeonpea, Finger millet, Intercropping, Net returns, B: C ratio

INTRODUCTION

Pigeonpea [*Cajanus cajan* (L.) Millsp.] is the second most important pulse crop of India after chickpea, grown in an area of 3.56 million hectares with a production of 2.31 million tonnes and productivity of 650 kg ha^{-1} (Anonymous, 2007). In Karnataka, pigeonpea stands the first in both area and production among pulses. It is grown in an area of 5.80 lakh hectares with a production of 2.60 lakh tonnes and productivity of 448 kg ha^{-1} as against the national average of 712 kg ha^{-1} (Anonymous, 2007). One of the major agronomic constraints for low productivity of pigeonpea is improper time of sowing. Pigeonpea suffers more when sowing is delayed (Padhi, 1995). Early sowing of pigeonpea *i.e.,* in the month of May, ensures higher yield (Shankaralingappa and Hegde, 1989). But in dryland areas, farmers are unable to sow pigeonpea in the month of May regularly because of non-receipt of sufficient rains and there is a stray cattle menace in the field damaging the early sown pigeonpea crop, as no other crop is available in the field. Because of these two constraints, the benefits of early sowing (May sowing) of pigeonpea could not be realized. Other alternative method of establishing pigeonpea in early season is, therefore, very much required for improving the productivity of pigeonpea. Raising pigeonpea seedlings well in advance and transplanting in the field on receipt of good rains would help in reaping the benefits of early sowing.

Finger millet [*Eleusine coracana* (L.) Gaertn.] is a staple food crop of Karnataka, it is grown in an area of 10.5 lakh hectares with annual production of 15.7 lakh tonnes with productivity of 1889 kg ha^{-1} (Anonymous, 2007). The farmers under dryland conditions practice sowing of pigeonpea as an intercrop in finger millet. In intercropping, the growth of pigeonpea is suppressed by finger millet at initial stages, as the growth of finger millet is faster. Sowing of pigeonpea as an intercrop in finger millet simultaneously in the month of July resulted in lower yield of pigeonpea (Anonymous, 1983). Staggered sowing of finger millet and pigeonpea (8:2) intercropping, *i.e.,* sowing of pigeonpea in May and introducing finger millet in July between paired rows of pigeonpea is profitable under dryland conditions (Shankaralingappa and Hegde, 1992). Under staggered sowing, pigeonpea gets an opportunity for full vegetative growth in intercropping system, though May sowing is not a suitable time for sowing finger millet. Besides, in view of non-receipt of sufficient rains in the month of May every year and also the problem of stray cattle menace, sowing of pigeonpea in May could not be possible in finger millet based intercropping system. The system of intercropping seems to be difficult to change due to its several benefits. Transplanting of pigeonpea seedling and direct sowing of finger millet in regular sowing time (July) simultaneously seems to be better option in place of staggered sowing of finger millet and pigeonpea (8:2) intercropping. Therefore, the experiment was conducted to identify the optimum age of pigeonpea seedlings for transplanting, to study the

*** Author for correspondence.**
[1]Department of Soil science and Agricultural Chemistry, College of Agriculture, University of Agricultural Sciences, G.K.V.K., BENGALURU (KARNATAKA) INDIA

effect of transplanting of pigeonpea on yield in sole cropping and finger millet based intercropping system and to know the effect of transplanted pigeonpea (intercrop) on finger millet (base crop).

MATERIALS AND METHODS

The field experiment was carried out at the Zonal Agricultural Research Station, GKVK, Bengaluru during *Kharif*, 2008 on sandy clay loam soil under rainfed conditions. The soil organic carbon content was low (0.38%). The soil was low in available N (198.9 kg ha^{-1}), high in available P (26.8 kg ha^{-1}) and medium in available K (202.8 kg ha^{-1}). The total rainfall received during the crop growth period was 767.7 mm as against 675.3 mm of the normal. The experiment was laid out in randomized complete block design, replicated thrice with 11 treatments involving transplanting of pigeonpea of different aged seedlings (3, 4 and 5 weeks) under sole cropping as well as finger millet based intercropping system along with direct sowing. The gross plot size was 6.6 m x 4.5 m for finger millet + pigeonpea (8:2) intercropping and sole crop of finger millet, 6.3 m x 4.5 m for sole crop of pigeonpea. The net plot size was 4.5 m x 3.9 m for sole pigeonpea, 5.4 m x 3.9 m for sole finger millet and 3.3 m x 3.9 m for finger millet + pigeonpea (8:2) intercropping. The sole finger millet was sown at 30 cm x 10 cm, whereas, sole pigeonpea was sown at 90 cm x 30 cm. The spacing between the two paired rows of pigeonpea in finger millet + pigeonpea intercropping was 2.7 m which was utilized for sowing or transplanting 8 rows of finger millet with a row spacing of 30 cm. pigeonpea seedlings were raised in polythene cover of size 15 x 5.5 cm filled with sand, silt and FYM in the ratio of 2:1:1 and two seeds were dibbled in each polythene cover on 11th, 18th and 25th July to get 5, 4 and 3 weeks old seedlings, respectively. Furrows were opened to a depth of 15-20 cm and then pigeonpea seedlings were transplanted after removing the polythene cover without disturbing the soil at the root zone of the seedling. The finger millet and pigeonpea were sown / transplanted on 16th July 2008. Gross returns (Rs. ha^{-1}) was calculated on the basis of market price of main product (grain) and byproduct (straw in case of finger millet and stalk in case of pigeonpea). Net returns (Rs. ha^{-1}) was calculated by deducting the cost of cultivation from gross returns. B:C ratio was worked out as follows:

$$\text{B:C ratio} = \frac{\text{Net returns (Rs. ha}^{-1}\text{)}}{\text{Cost of cultivation (Rs. ha}^{-1}\text{)}}$$

Table 1 : Yield of pigeonpea and finger millet and economics of finger millet and pigeonpea intercropping as influenced by transplanting of different aged seedlings and direct sowing of pigeonpea

Treatments	Pigeonpea		Finger millet		Gross returns (Rs. ha^{-1})	Cost of cultivation (Rs. ha^{-1})	Net returns (Rs. ha^{-1})	B:C ratio
	Grain yield (kg ha^{-1})	Stalk yield (kg ha^{-1})	Grain yield (kg ha^{-1})	Straw yield (kg ha^{-1})				
FM + transplanted pigeonpea with 3 weeks old seedlings	1168	4398	1911	2859	45138	16728	28410	1.70
FM + transplanted pigeonpea with 4 weeks old seedlings	1347	4748	1880	2815	48692	16818	31874	1.90
FM + transplanted pigeonpea with 5 weeks old seedlings	1357	5190	1461	2149	44751	16908	27843	1.65
FM + direct sown pigeonpea	391	1564	1992	2976	28783	12607	16176	1.28
Transplanting of FM + direct sown pigeonpea	456	1461	2137	4266	33083	13267	19816	1.49
Direct sowing of FM + early direct sown pigeonpea	539	1761	1961	2930	31637	12607	19030	1.51
TP of 3 weeks old pigeonpea seedlings as sole crop	2418	12769	-	-	54609	19934	34675	1.74
TP of 4 weeks old pigeonpea seedlings as sole crop	2576	12952	-	-	57982	20024	37958	1.90
TP of 5 weeks old pigeonpea seedlings as sole crop	2669	13493	-	-	60097	20114	39983	1.99
Direct sowing of sole crop of pigeonpea	1575	3504	-	-	34126	12309	21817	1.77
Sole crop of finger millet	-	-	2344	3750	24002	9092	14910	1.64
S. E. (±)	133	206	141.8	218.6	3162	-	3011	-
C.D. (P= 0.05)	396	612	437.0	673.8	9329	-	8884	-

FM = Finger millet, TP= Transplanting
Market price**:** Pigeonpea **:** Grain: Rs. 2100 q^{-1} and Stalk: Rs. 300 t^{-1}, Finger millet : Grain: Rs. 800 q^{-1} and Straw: Rs. 1400 q^{-1}

RESULTS AND DISCUSSION

The results obtained from the present study are summarized in Table 1.

Transplanting of 5 weeks old pigeonpea seedlings resulted in significantly superior grain yield of 2669 kg ha^{-1} than direct sowing (1575 kg ha^{-1}) by 69.5 per cent in sole cropping and was at par with 3 and 4 weeks old seedlings. The sole crop of pigeonpea with transplanting of 5 weeks old seedlings recorded significantly higher gross returns (Rs. 60097 ha^{-1}), net returns (Rs. 39983 ha^{-1}) with higher B:C ratio of 1.99 than direct sown sole crop of pigeonpea (Rs. 34126 ha^{-1}, Rs. 21817 ha^{-1} with B:C ratio of 1.77, respectively). Higher gross returns, net returns and B:C ratio in sole crop of transplanted pigeonpea with transplanting of 5 weeks old seedlings was due to better performance of pigeonpea (Table 1). Singh *et al*. (2006), Anonymous (2008), Anonymous (2009) and Basavennappa *et al.* (2009) reported that transplanted crop gave significantly higher gross returns and net returns than direct sowing.

Finger millet + transplanted pigeonpea (8:2) intercropping with transplanting of 4 weeks old seedlings produced significantly higher pigeonpea grain yield of 1347 kg ha^{-1} with finger millet grain yield of 1880 kg ha^{-1} compared to finger millet + direct sown pigeonpea (pigeonpea grain yield of 391 kg ha^{-1} with finger millet grain yield of 1992 kg ha^{-1}). Finger millet + transplanted pigeonpea with 4 weeks old seedlings gave significantly higher gross returns (Rs. 48692 ha^{-1}), net returns (Rs. 31874 ha^{-1}) with B:C ratio of 1.90 compared to finger millet + direct sown pigeonpea (Rs. 28783 ha^{-1} to Rs. 33083ha^{-1}, Rs. 16176 ha^{-1} to Rs. 19816 ha^{-1} with B:C ratio of 1.28 to 1.51, respectively). It was mainly due to higher yield of pigeonpea, which had higher market price and marginal reduction in yield of finger millet.

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