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Economic feasibility of senna (*Cassia angustifolia* Vahl) intercropping with cotton, pigeonpea and castor at different row proportions in dry land situations*

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Abstract: A field experiment was conducted at Regional Agricultural Research Station, Bijapur (Karnataka) on medium deep black soil during *kharif* season of 2005 to assess the performance of senna (*Cassia angustifolia*) in cotton, pigeonpea and castor at different row proportions. The treatment consists of cotton, pigeonpea, castor and senna in sole stand as well as intercropping system with two row proportions and pigeonpea + pearlmillet (1:2) intercropping system as a check. Intercropping of cotton, pigeonpea and castor with senna significantly reduced the leaf yield (574.79 kg ha^{-1}), pod yield (221.94 kg ha^{-1}) and stover yield (1024.68 kg ha^{-1}) of senna as compared to the sole crop of senna (952.64 kg ha^{-1}, 357.86 and 1693.88 kg ha^{-1}), respectively. Intercropping of senna with cotton in 1:1 and 1:2 row proportions recorded significantly higher gross returns (₹ 33,429ha^{-1} and ₹ 34,687 ha^{-1}, respectively) and net returns (₹ 21,271ha^{-1} and ₹ 22,529 ha^{-1}, respectively), Land Equivalent Ratio (1.41 and 1.44, respectively,) and Area Time Equivalent Ratio (1.38 and 1.41, respectively,) over other intercropping systems.

Key words: Area time equivalent ratio, intercropping, senna, land equivalent ratio

Introduction

Cotton, pigeonpea and castor are the important crops of *kharif* season in northern dry zone of Karnataka. As they are long duration and initially slow growing, adverse effect of weather and occurrence of pests and diseases results in low productivity. Intercropping of these crops with hardy crops like senna (*Cassia angustifolia*) appears to be a choice to ensure higher production under such a situation. Senna belongs to family *caesalpinaceae*, it is one of the most important dryland medicinal crop popularly known as Indian and Tinnevelly senna. The leaves and pods of this plant are used and sold as laxatives, purgatives and diuretic. These are alsoused in decoction powder, confectionary and many other herbal preparations. In European countries it is used for the preparation of herbal tea. Nearly 28 bioactive molecules are isolated from this plant. The strong laxative properties of leaves and pods are due to the presence of sennoside A and B and dianthone glycosides (Patra *et al.*, 2005). In the present investigation, the feasibility of intercropping of senna with cotton, pigeonpea and castor were studied.

Material and methods

The field experiment was carried out at Regional Agricultural Research Station, Bijapur, University of Agricultural Sciences, Dharwad, during *kharif* season of 2005 to assess the performance of senna with cotton, pigeonpea and castor at different row proportions. There were eleven treatment combinations comprising of three intercrops (cotton, pigeonpea and castor) and two row proportions (1:1 and 1:2) with one each sole crops of senna, cotton, pigeonpea with castor and pigeonpea + pearlmillet (1:2) intercropping system as a check. The experiment was laidout in a Randomized Complete Block Design with three replications. The soil of the experimental field was clay loam having organic carbon 0.42%, low in available nitrogen (181 kg ha^{-1}) and phosphorous (19.5 kg ha^{-1}) and medium in available potash (361 kg ha^{-1}) and EC 0.41 dS/m with pH 8.80. The recommended spacing was followed for all intercrops (Cotton- 90 cm x 30 cm, Pigeonpea- 45 cm x 30 cm and castor- 90 cm x 30 cm). The varieties used are senna - Tinnevelly senna, cotton- sahana, pigeonpea – GC-11-39 and castor – 48-1. In the intercropping system, one and two row respectively was replaced and senna was introduced in 1:1 and 1:2 row proportion with pigeonpea and in case of cotton and castor, senna was introduced in between two rows without replacing cotton and castor in additive series. The recommended dose of fertilizers (NPK kg ha^{-1}) was given for all the component crops (cotton- 30:15:15, pigeonpea- 25:50:00, castor- 25:25:25, and senna- 60:40:20) in the form of urea, diammonium phosphate and muriate of potash as a basal dose. In case of intercropping treatments, the fertilizers were applied in proportionate to the sole optimum population for main crop and intercrops separately. The rainfall was ill distributed during the crop growth period one protective irrigation was siven to all crops farm ponds water. weeding and plant protection measures were undertaken, and the required plant population was maintained. Various growth parameters at 30, 60, 90, 120, 150 and 180 days after sowing (DAS) were recorded. The Land Equivalent Ratio (LER) was worked out by using the formula (Willey, 1979).

$$LER = LA + LB = \frac{YA}{SA} + \frac{YB}{SB}$$

Where,

LA and LB are the LER for the individual crops, YA and YB are the individual crop yields in intercropping and SA and SB are their sole crop yields. Area Time Equivalent Ratio (ATER)

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