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Comparative performance of senna (*Cassia angustifolia* Vahl) with pearlmillet, groundnut and sunflower at different row proportions*

The Northern dry zone of Karnataka receives an annual rainfall of 594.3 mm which is sufficient to raise the sole crops of pearlmillet, groundnut and sunflower during *kharif* with very low productivity, as they are slow growing initially more often suffer adversely due to moisture stress and occurrence of pests and diseases. Intercropping of these crops with hardy crops like senna appears to be a choice to ensure higher production under such a situation. The leaves and pods of senna are used and sold as laxatives, purgatives and diuretic and used against habitual constipation, 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. Materials in dry powdered or decoction form have been used as a stimulant, vermifuge and cathartic and for relieving habitual constipation (Patra *et al*., 2005).

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 pearlmillet, groundnut and sunflower at different row proportions. There were twelve treatment combinations comprising of three intercrops (pearlmillet, groundnut and sunflower) and four row proportions (1:1, 1:2, 1:3 and 3:3) with one each sole crops of senna, pearlmillet, groundnut and sunflower and pearlmillet + groundnut (2:4) 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%, available nitrogen 181 kg ha^{-1}, phosphorous 19.5 kg ha^{-1} and potash 361 kg ha^{-1} and EC 0.41 dS/m with pH 8.80. The recommended spacing was followed for all intercrops. In the intercropping system, one, two and three row respectively was replaced and senna was introduced in 1:1, 1:2, 1:3 and 3:3 row proportion with pearlmillet, groundnut and sunflower. Senna was intercropped in additive series. The recommended dose of fertilizers (NPK kg ha^{-1}) was given for all the component crops in the form of urea, diammonium phosphate and monoammonium phosphate 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. Weeding and plant protection measures were undertaken as per their neeed, the required plant population was maintained. The crop was protected with insects' pests. Various growth parameters at 30, 60, 90, 120, 150 DAS and at 180 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) was calculated by the following formula (Hiebsch, 1980).

$$ATER = \frac{(RYA \times tA) + (RYB \times tB)}{T}$$

$$Ry = \frac{\text{Yield of intercrop per hectare}}{\text{Yield of sole crop per hectare}}$$

Where,

Ry = Relative yield of species A and B

t = Duration (days) of species A and B

T = Duration (days) of the intercropped system

The crops were harvested at their physiological maturity. In case of senna picking of leaves and pods was done by hand, the first picking of the foliage crop was done at 120 days after sowing and subsequent picking at 30 days interval and the harvested crop leaves and pods are spread in a thin layer in an open field to reduce its moisture. The leaves and pods were separated and air dried. At the time of sowing adequate moisture was present in the soil. Fischer's method of analysis of variance was used for analysis and interpretation of the data as outlined by Gomez and Gomez (1984).

The leaf and pod yields of senna in sole cropping system were higher by 26.17 and 29.68 percent when compared to intercropped senna. The reduced leaf and pod yield of senna under intercropping systems might be attributed to increased plant population per unit area resulting in increased competition for growth resources, specially the moisture, nutrients and light. Similar results of decreased dry root and seed yield of ashwagandha was reported when intercropped with sunflower (Chandranath, 2006) and pigeonpea (Koppalkar, 2007) and reduction in the herb yield of palmarosa when intercropped with pigoenpea has been reported by Singh *et al.* (1998).

The leaf and pod yield of senna was remarkably reduced when it was intercropped with pearl millet, groundnut and sunflower as compared to its sole crop yields. Pearlmillet, groundnut and sunflower as intercrops cause conspicuous difference in leaf and pod yield of senna. The senna recorded significantly, higher leaf and pod yield when intercropped with groundnut and pearlmillet than sunflower irrespective of the row proportions studied and was significant. This indicates that these three crops have different effect on the growth and yield of senna because of their growth habits and difference in maturity periods. The leaf and pod yield of senna produced with intercropping of groundnut and pearl millet was 15.91 and 13.13 per cent respectively, and 11.60 and 11.66 percent higher, respectively, over intercropping of sunflower.

The leaf yield of senna under 1:3 row proportion was significantly superior over rest of the row proportions studied. The leaf yield produced under 1:3 row proportion was higher by 17.49, 5.28 and 15.59 percent when compared to the leaf yield recorded under 1:1, 1:2 and 3:3 row proportions, respectively. Similarly, the pod yield of senna under 1:3 and 1:2 row proportions of senna and intercrops were on par with each other and were

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