

EFFECT OF SPACING AND NUTRIENT MANAGEMENT ON QUALITY AND YIELD OF DHAINCHA (*Sesbania aculeata* L.) UNDER SOUTH GUJARAT CONDITION

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ABSTRACT

A field experiment was conducted during rabi season of the year 2010-2011 at College Farm, Navsari Agricultural University, Navsari (Gujarat) to study “Response of dhaincha (*Sesbania aculeata* L.) to spacing and nutrient management under South Gujarat condition”. Sixteen treatment combinations consisting of two levels of spacing, 45 cm x 10 cm and 60 cm x 10 cm, two levels of inorganic fertilizers, 75 per cent RDF and 100 per cent RDF, and four levels of biofertilizer, no biofertilizer, *Rhizobium* (*Azorhizobium caulinodans*), *Phosphate solubilizing bacteria* (*Bacillus coagulans*) and combination of *Rhizobium* (*Azorhizobium caulinodans*) + *Phosphate solubilizing bacteria* (*Bacillus coagulans*) were evaluated in split-split plot design with three replications. The results revealed that rabi dhaincha (var. Local) should be grown with 60 x 10 cm spacing and fertilized with 100 per cent RDF (25-50 kg NP/ha) along with *Rhizobium* + *phosphate solubilizing bacteria* seed inoculation under south Gujarat condition for getting good quality higher seed and straw yield with high protein yield and monetary returns.

KEY WORDS: Biofertilizer, dhaincha, nutrient management, quality, spacing

INTRODUCTION

Dhaincha (*Sesbania aculeata* L.), is an annual shrub cultivated as legume especially for its fine fibre in many countries. Proper spacing provides sufficient interception of light and satisfactory absorption of nutrients and water from the soil due to the proper development of root system and results in higher crop yield. Similarly, nutrient management approach helps in building soil fertility. Dhaincha being a leguminous crop utilizes atmospheric nitrogen through symbiotic nitrogen fixation to meet a major part of its nitrogen requirement. The seed inoculation with proper strain of biofertilizer is the low cost input for enhancing quality and

yield. Phosphorus solubilizes the native phosphorus by the secretion of organic acid. Inoculation with phosphate solubilising bacteria alone increased the grain yield of dhaincha by about 8.3 per cent than that of no inoculation. (Meena *et al.*, 2001). Considering the above facts and views, the present experiment was planned.

MATERIALS AND METHODS

A field experiment was conducted during rabi season of the year 2010-2011 at College Farm, Navsari Agricultural University, Navsari (Gujarat) to study “Effect of spacing and nutrient management on quality and yield of dhaincha (*Sesbania aculeata* L.) under South Gujarat condition”. The soil of the

experimental field was clayey in texture, low in available nitrogen (232.50 kg/ha), medium in available phosphorus (32.00 kg/ha) and fairly rich in available potassium (350.00 kg/ha) with 7.8 soil pH. Sixteen treatment combinations consisting of two levels of spacing as main plot i.e., S₁: 45 cm x 10 cm and S₂: 60 cm x 10 cm, two levels of inorganic fertilizers as sub plot viz., 75 per cent RDF (F₁) and 100 per cent RDF (F₂) and four levels of biofertilizer as sub-sub plot viz., No biofertilizer (B₀), *Rhizobium* (*Azorhizobium caulinodans*) (B₁), Phosphate solubilizing bacteria (*Bacillus coagulans*) (B₂) and *Rhizobium* (*Azorhizobium caulinodans*) + Phosphate solubilizing bacteria (*Bacillus coagulans*) (B₃) were evaluated in split-split plot design with three replications. Recommended dose of fertilizer (RDF) was 25: 50: 00 NPK kg/ha. Other cultural practices and plant protection measures were taken as per recommendations. The data on seed and straw yield were recorded from each net plot and converted on hectare basis. Protein content was obtained by multiplying nitrogen content of seed with conversion factor of 6.25 (Bhuiya and Chowdhary, 1974). The protein yield was computed by using following formula.

$$\text{Protein yield (kg/ha)} = \frac{\text{Protein content in seed (\%)} \times \text{Seed yield (kg/ha)}}{100}$$

The data were analyzed statistically by adopting the standard procedures described by Panse and Sukhatme (1967).

RESULT AND DISCUSSION

Effect of Spacing

The data of yield, quality and economics of *rabi* dhaincha as influenced by various treatments were presented Table 1. The data revealed that significantly the highest seed and straw yield was recorded with S₂ (60 cm) as compared to S₁ (45 cm). These findings were corroborated the results of Ulemale and Shivankar (2003) and Lamani *et al.* (2004) in sunnhemp and Kumar *et al.* (2005) in Dhaincha with respect to seed yield and Yadav

(2003) in cowpea with respect to seed and straw yield. Protein content did not differ significantly. However, protein yield was influenced significantly due to different spacing treatments. Significantly higher protein yield (297.74 kg/ha) was recorded under treatment S₂ (60 cm) as compared to treatment S₁ (45 cm) (267.55 kg/ha). These results are in accordance with the finding of Rajesh *et al.* (1998). Maximum net return of ₹. 88684/ha and BCR value of 5.4 was recorded under S₂ (60 cm) spacing over S₁ (45 cm), which recorded net return of ₹. 79811/ha with BCR value of 4.7. This was due to higher yield of seed and straw registered under S₂ (60 cm) spacing. Similar results were also reported by Kumar (2004) in cowpea.

Effect of inorganic fertilizer

Treatment receiving 100 per cent RDF (F₂) produced significantly the highest seed (1520 kg/ha) yield over other treatment F₁. The results were supported by the findings of Rengalakshmi and Purshothman (1999) in dhaincha, Kumar *et al.* (2005) and Shastri *et al.* (2007) in sunnhemp and Sharma *et al.* (2003) in greengram. Straw yield remained unaffected by various inorganic fertilizers (Table 1). However, numerically increase in straw yield with application of 100 per cent RDF (F₂) was observed as compared to 75 per cent RDF (F₁) (Table 1). The application of 100 per cent RDF (F₂) significantly increased protein yields in dhaincha. This was attributed to higher protein content and seed yield recorded under this level of inorganic fertilizers. Similar findings were also reported by Ambhore (2004) in greengram. The net return of ₹. 86645/ha with BCR value of 4.8 was obtained under treatment receiving 100 per cent RDF (F₂) as against the net return of ₹. 80018/ha and BCR of 4.5 with 75 per cent RDF (F₁) treatment (Table 2). This was due to higher yield in F₁, ultimately reflected into higher net realization and BCR. Similar results were also reported by

Ambhore (2004) in greengram and Kumar *et al.* (2005) in sunnhemp.

Effect of Biofertilizer

Significantly the highest seed yield (1729 kg/ha) and straw yield (9071 kg/ha) were recorded with *Rhizobium* (*Azorhizobium caulinodans*) + phosphate solubilizing bacteria (*Bacillus coagulans*) inoculation (B₃) over no inoculation (B₀). This might be due to significant and progressive effect of *Rhizobium* (*Azorhizobium caulinodans*) + phosphate solubilizing bacteria (*Bacillus coagulans*) inoculation on yield attributes viz., number of pods per plant and test weight. These results corroborated the findings of Jain and Singh (2003) in gram and Nagar and Menna (2004) in clusterbean (Table 1). Significantly the highest protein yield of (338.19 kg/ha) (Table 1) was recorded with (*Rhizobium* (*Azorhizobium caulinodans*) + phosphate solubilizing bacteria (*Bacillus coagulans*)) inoculation (B₃) over phosphate solubilizing bacteria (*Bacillus coagulans*) inoculation (B₂), *Rhizobium* (*Azorhizobium caulinodans*)) inoculation (B₁) and no biofertilizer inoculation (B₀). Similar results were obtained by Nagar and Menna (2004) in clusterbean. There was an appreciable increased in net realization due to biofertilizer. The highest net return of ₹. 101270/ha with BCR value of 6.0 was obtained with *Rhizobium* (*Azorhizobium caulinodans*) + phosphate solubilizing bacteria (*Bacillus coagulans*) inoculation (B₃). This was due to comparatively better increase in yield with B₃ (1729 kg/ha) treatment over B₂ (1546 kg/ha), B₁ (1361 kg/ha) and B₀ (1236 kg/ha). These results are in accordance with the findings of Bhalu *et al.* (1995) in blackgram and Singh *et al.* (2004) in legumes.

CONCLUSION

From the results, it can be concluded that rabi dhaincha (var. Local) should be grown with 60 × 10 cm spacing and fertilized with 100 per cent RDF (25-50 kg NP/ha) along with *Rhizobium* + phosphate solubilizing bacteria seed inoculation under south Gujarat

condition for getting good quality higher seed and straw yield with high protein yield and monetary returns.

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Table 1: Yield, quality and economics of *rabi dhaincha* as influenced by various treatments.

Treatment	Seed Yield (kg/ha)	Straw Yield (kg/ha)	Protein Content (%)	Protein Yield (kg/ha)	Gross Realization (₹./ha)	Cost of Cultivation (₹./ha)	Net Realization (₹./ha)	BCR
Spacing (S)								
S ₁ = 45cm	1403	8053	19.07	267.55	96459	16648	79811	4.7
S ₂ = 60cm	1533	8383	19.41	297.74	105017	16333	88684	5.4
S. Em. ±	21.15	115.25	0.10	4.23	-	-	-	-
C.D. (P=0.05)	128.69	204.24	NS	25.72	-	-	-	-
C.V. %	7.06	6.37	2.40	11.56	-	-	-	-
Inorganic Fertilizer (F)								
F ₁ = 75 % RDF	1416	8335	19.30	273.28	97558	17540	80018	4.5
F ₂ = 100 % RDF	1520	8665	19.63	298.37	104483	17838	86645	4.8
S. Em. ±	22.71	119.12	0.11	2.46	-	-	-	-
C.D. (P=0.05)	89.20	NS	NS	8.01	-	-	-	-
C.V. %	7.58	7.20	3.87	5.29	-	-	-	-
Biofertilizer (B)								
B ₀ = No Bio fertilizer	1236	8100	18.87	233.23	86024	16648	69376	4.1
B ₁ = <i>Rhizobium</i>	1361	8460	19.10	259.95	94223	16698	77525	4.6
B ₂ = PSB	1546	8794	19.06	294.66	106241	16698	89543	5.3
B ₃ = <i>Rhizobium</i> + PSB	1729	9071	19.56	338.19	118018	16748	101270	6.0
S. Em. ±	30.33	124.70	0.18	3.79	-	-	-	-
C.D. (P=0.05)	88.54	220.95	NS	11.05	-	-	-	-
Interaction								
S X F	NS	NS	NS	NS	-	-	-	-
S X B	NS	NS	NS	NS	-	-	-	-
F X B	NS	NS	NS	NS	-	-	-	-
S X F X B	NS	NS	NS	NS	-	-	-	-
C.V. %	7.16	5.32	4.53	8.16	-	-	-	-

Selling price of *Dhaincha*: Seed – ₹. 63/kg and Straw – ₹. 1.0/kg

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