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Effect of fertility levels and cutting management on yield and economics of fenugreek under North Gujarat condition

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Abstract
A field experiment was carried at Agricultural Research Station, Sardarkrushinagar Dantiwada Agricultural University, Aseda, Gujarat during three consecutive *rabi* season from the year 2020-21 to 2022-23. Experiment was comprised of total twelve combinations of treatment in which three fertilizer levels *viz*; F_1: 100% RDF, F_2: 125% RDF, F_3: 150% RDF and three cutting management C_1: No cutting (Only seed production), C_2: Cutting at 50 DAS as leafy vegetable + seed production, C_3: Cutting at 40 and 70 DAS as leafy vegetable + seed production, C_4: Cutting at 30, 50 and 70 DAS as leafy vegetable + seed production laid out in randomized block design with factorial concept in three replications. higher net realization and BCR were incurred under the treatment receiving 150% RDF (33031 ₹/ha and 1.77) followed by 125% RDF (31121 ₹/ha and 1.73) and Cutting at 40 and 70 DAS as leafy vegetable + seed production (C_3) which recorded higher net realization of 38207 ₹/ha followed by Cutting at 50 DAS as leafy vegetable + seed production (C_2) of 37981 ₹/ha with BC ratio of 1.80 and 2.03 respectively. The lower value of net realization and BCR were recorded under 100% RDF (23358 ₹/ha and 1.56) and no cutting (10938 ₹/ha and 1.742) respectively.

Keywords: Fenugreek, seed equivalent yield, net realization, BCR

Introduction
India is largest consumer, exporter and producer of spices in the world. Being spice crop fenugreek (*Trigonella foenum-graecum* L.) also used as green leafy vegetable and medicinal properties. It is locally known as 'methi' belonging to the Leguminosae family and used as spice and condiment to add flavour in various to a variety of cuisines. It seeds are used to lower the blood glucose and blood cholesterol levels due to presence of large amounts of soluble fiber in them and grown under marginal and sub-marginal lands. Chemical analysis of fenugreek seed revealed that it contains 13.7 per cent water, 26.2 per cent protein, 5.8 per cent fat, 3 per cent mineral matter, 7.2 per cent fiber, 4.41 per cent carbohydrate, 0.16 per cent calcium, 0.37 per cent phosphorus, 14.1 mg iron, 333 calories and 160 IU carotene per 100 g [1]. Fenugreek is mainly grown in India, Pakistan, China, Nepal and Bangladesh. In India, it is commercially grown in Rajasthan, Gujarat, Madhya Pradesh, Haryana, West Bengal, Punjab and Maharashtra. Rajasthan occupies 80% of area and production. The major area was occupied by Rajasthan (90.9 M.ha) followed by Madhya Pradesh (52.2 M.ha) and Gujarat (8.7 M.ha.) with production of 110.8, 101.8 and 16.6 M tonnes respectively [2]. In Gujarat it being cultivated in 8702 ha. area with 16697 kg production during the year 2021-22. Farmers are taking this crop for the leafy vegetable and also for seed production. By choosing the appropriate rate of fertilizers and stage of crop for cutting, this experiment was undertaken. It will also determine the best nutrient levels and appropriate stage of leaf cutting to enhance equivalent yield with minimum cost for the getting higher net realization and benefit.

Materials and Methods
An experiment on the fertility levels and cutting managements in fenugreek was conducted at Agricultural Research Station, Sardarkrushinagar Dantiwada Agricultural University, Aseda,

Gujarat during three consecutive *rabi* season of years 2020-21 to 2022-23. Different treatments of three fertility levels *viz*; F_1: 100% RDF, F_2: 125% RDF, F_3: 150% RDF and three cutting management C_1: No cutting (Only seed production), C_2: Cutting at 50 DAS as leafy vegetable + seed production,C_3: Cutting at 40 and 70 DAS as leafy vegetable + seed production, C_4: Cutting at 30, 50 and 70 DAS as leafy vegetable + seed production laid out in radomized block design with factorial concept in three replications. Fenugreek variety PEB (Pusha Early Bunch) was sown at second fort night of November of every season of the consecutive three years with line sowing at 45 cm X 10 cm spacing of. The experiment field was prepared by applying farm yard manure @ 5 t/ha followed by ploughing at 15 days before sowing and second times ploughing followed by planking were done for smoothing the plot for sowing.

The half dose of nitrogen and full dose of phosphorus were applied through urea and single super phosphate as basal at the time of sowing and remaining nitrogen was top dressed at 30 days after sowing (DAS). The observation of plant height at 30, 40, 50 and 70 DAS before each cuts. The cutting was made at 30, 40, 50 and 60 DAS according to treatments and nitrogen fertilizer was top dressed to crop after each cut. Green leaf yield was taken from net plot area and converted ion hectare basis and seed yield also counted with the same procedure. Data were statistically analyzed using analysis of variance (ANOVA) procedure according to Gomez and Gomez [3].The mean differences were compared using LSD at 5%.

Results and Discussion

The effect of different levels of fertility and cutting management on seed equivalent yield of fenugreek remained significant in all season as well as on pooled basis. Among the fertility levels, the treatment of fertility F_3: 150% RDF recorded significantly higher seed equivalent yield of fenugreek in on pooled basis and remained statistically at par with the treatment F_2: 125% RDF. In cutting management, in year 2020-21 treatment C_2 (Cutting at 50 DAS as leafy vegetable + seed production) recorded higher seed equivalent yield and remained statistically at par with C_3. In year 2021-22 and 2022-23 treatment C_4: Cutting at 30, 50 and 70 DAS as leafy vegetable + seed production recorded significantly higher seed equivalent yield and remained statistically at par with the treatment C_3 while in pooled results treatment C_3: Cutting at 40 and 70 DAS as leafy vegetable + seed production, recorded higher seed equivalent yield and remained statistically at par with C_2 and C_4. It might be due to increased green leaf and seed yield, which resulted in the maximum harvest index [4-12].

Economics

The data presented in Table 1. Shows that with increasing the levels of fertility levels, the cost of production also increased. Total common cost was recorded higher with the treatment combination F_3C_4 (₹ 59016/ha) followed by F_2C_4 (₹ 58339/ha) and F_1C4 (₹ 57662/ha). The lower total cost was recorded under the treatment combination F_1C_1 (₹ 25607/ha) followed by F_2C_1 (₹ 26284/ha) and F_3C_1 (₹ 26961/ha).

The result revealed in Table 2. elaborates that the higher net realization and BCR were incurred under the treatment receiving 150% RDF (33031 ₹/ha and 1.77) followed by 125% RDF (31121 ₹/ha and 1.73) and Cutting at 40 and 70 DAS as leafy vegetable + seed production (C_3) which recorded higher net realization of 38207 ₹/ha followed by Cutting at 50 DAS as leafy vegetable + seed production (C_2) of 37981 ₹/ha with BC ratio of 1.80 and 2.03 respectively. The lower value of net realization and BCR were recorded under 100% RDF (23358 ₹/ha and 1.56) and no cutting (10938 ₹/ha and 1.742) respectively.

The data predicted in Fig.1 denotes that higher values of net realization and benefit cost ratios were obtained under the treatment combinations of F_3C_2 (43277 and 2.15) and lower values was recorded under the combination of F_1C_1 (8205 and 1.32). The higher net realization and benefit received from the treatment secures higher fenugreek equivalent yield with lower input cost [13-15].

Table 1: Total cost of different treatment combinations

Treatment	Treatment combination	Cost of Fertilizer		Cutting (Number)	Labour (₹)	Required Irrigation (Number)	Irrigation cost (₹)	Labour used for fertilizer+irrigation (Number)	Labour charges (₹)	Total treatment (₹)	Total Common (₹)	Total cost (₹)
		Urea (₹)	SSP (₹)									
T_1	F1C1	258	2450	0	0	6	6600	2	710	10018	15589	25607
T_2	F1C2	258	2450	1	8875	7	7700	4	1420	20703	15589	36292
T_3	F1C3	258	2450	2	17750	8	8800	6	2130	31388	15589	46977
T_4	F1C4	258	2450	3	26625	9	9900	8	2840	42073	15589	57662
T_5	F2C1	322	3063	0	0	6	6600	2	710	10695	15589	26284
T_6	F2C2	322	3063	1	8875	7	7700	4	1420	21380	15589	36969
T_7	F2C3	322	3063	2	17750	8	8800	6	2130	32065	15589	47654
T_8	F2C4	322	3063	3	26625	9	9900	8	2840	42750	15589	58339
T_9	F3C1	387	3675	0	0	6	6600	2	710	11372	15589	26961
T_{10}	F3C2	387	3675	1	8875	7	7700	4	1420	22057	15589	37646
T_{11}	F3C3	387	3675	2	17750	8	8800	6	2130	32742	15589	48331
T_{12}	F3C4	387	3675	3	26625	9	9900	8	2840	43427	15589	59016

Table 2: Economics of different treatments

Treatment	Fenugreek seed equivalent yield (kg/ha)	Gross realization (₹/ha)	Cost of cultivation (₹/ha)	Net return (₹/ha)	BCR
Fertility levels (F)					
F_1: 100% RDF	1298	64715	41549	23358	1.56
F_2: 125% RDF	1469	73432	42227	30313	1.71
F_3: 150% RDF	1520	76020	42904	33116	1.77
Cutting management (C)					
C_1: No cutting (Only seed production)	741	37056	25933	10938	1.42

C_2: Cutting at 50 DAS as leafy vegetable + seed production	1501	75040	37328	37392	2.00
C_3: Cutting at 40 and 70 DAS as leafy vegetable + seed production	1719	85952	47658	38109	1.80
C_4: Cutting at 30, 50 and 70 DAS as leafy vegetable + seed production	1755	87764	57988	29278	1.50

Selling price: Fenugreek seed @50 ₹/kg. Green leaf @ 8 ₹/kg, Labour charge @ 355 ₹/day
Price of different inputs (₹/kg): Urea@5.92, SSP@9.8**,** NPK consortia@200

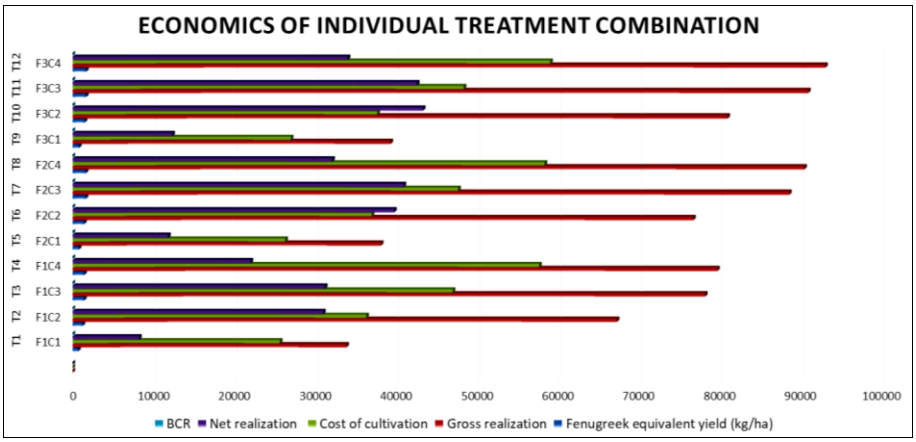

Fig 1: Economics of treatment combinations

Conclusion

From the above study it can be concluded that to achieve higher fenugreek seed equivalent yield with lower cost of production with higher economic returns, apply 125% RDF (25-50 N-P_2O_5 kg/ha) in which whole dose of phosphorus (50 P_2O_5 kg/ha in the form of SSP) along with half dose of nitrogen (12.5 kg. N/ha) per hectare as basal and remaining half dose of nitrogen (12.5 kg. N/ha) after cutting at 50 days after sowing and left for seed production.

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