

Response of maize (*Zea mays*), wheat (*Triticum aestivum*) and gobhi sarson (*Brassica napus* subsp. *oleifera* var. *annua*) to balanced fertilization and azotobacter inoculation in subhumid Punjab

M. S. GILL, D. S. RANA AND R. S. NARANG

Department of Agronomy, Punjab Agricultural University, Ludhiana 141 004

Received: April 1992

The technology developed for subhumid Punjab at the research station has no significance unless it is accepted by the farmers. With this objective, a large number of on-farm research experiments were conducted on the cultivators field's to test their site-specific performance as well as acceptability with the farmers at large. Three types of trials were conducted to establish the fertilizer response (N, P, K and Zn and azotobacter inoculation) on wheat (*Triticum aestivum* L. emend. Fiori & Paol.), maize (*Zea mays* L.) and gobhi sarson (*Brassica napus* L. subsp. *oleifera* DC. var. *annua* L.) raised under irrigated conditions and moisture-constraint situations during 1989-90. These trials were conducted at 22 locations (treated as replications) in Hoshiarpur district, representing the whole subhumid belt in relation to soil type, irrigation facilities and climatic conditions.

Maize cv. 'Navjot' was sown in the first week of June, using 20 kg seed rate/ha at 50 cm-row and 22 cm-plant spacings. Fertilizers were applied as per treatments, one-third N and full dose of P, K, ZnSO_4 and azotobacter were applied at sowing, the remaining one-third N at knee-high and one-third N at pre-tasselling stage. The weeds were controlled by spraying Atrataf 50 wp @ 20 kg/ha as pre-emergence spray in 500 litres water. The crop was harvested in

middle of October at all the locations.

The wheat cv. 'HD 2329' was sown in the first week of November, using 100 kg seed rate/ha at 22 cm-row spacing. The wheat seed was treated with aldrin 30 EC @ 4 ml/kg seed to control termite attack. Fertilizers were applied as per treatments; half N and full dose of other fertilizers were applied at sowing and the remaining N with first irrigation 28 days after sowing. The weeds were controlled by spraying isoproturon 75 wp @ 1.25 kg/ha as post-emergence spray (30-40 days after sowing). The crop was harvested in middle of April at all the locations. Likewise, gobhi sarson cv. 'GSL 1' was sown in the third week of October at all the 22 locations, using 5 kg seed rate/ha with 45 cm-row spacing. The thinning was done 3 weeks after sowing to maintain plant spacing 10 cm. The fertilizers were applied as per treatments; half N and full dose of P and K were applied at sowing and the remaining half N with first irrigation (28 days after sowing). The crop was sprayed with metasystox 25 EC @ 625 ml/ha in 250 litres water to control aphid attack. The crop was ready for harvesting in the first week of April.

In a study on fertilizer requirement of maize under constraint of irrigation, the maize yield increased with each level of fertilizer. The highest grain yield (26.1 q/ha)

Table 1. Fertilizer requirement of maize and wheat under constraint of irrigation in Hoshiarpur district during 1989-90

Treatment	Nutrient (kg/ha)			Zn or <i>Azotobacter</i>	Grain yield (q/ha)	
	N	P ₂ O ₅	K ₂ O		Maize	Wheat
T ₁	0	0	0		12.5	17.0
T ₂	40	0	0		14.7	22.7
T ₃	80	0	0		16.5	26.5
T ₄	40	40	0		16.6	26.7
T ₅	40	0	40		16.0	24.3
T ₆	40	40	40		18.0	28.5
T ₇	40	40	40	<i>Azotobacter</i>	19.1	30.4
T ₈	80	40	0		20.4	32.3
T ₉	80	0	40		21.2	29.4
T ₁₀	80	40	40		22.9	35.3
T ₁₁	80	40	40	<i>Azotobacter</i>	24.5	36.7
T ₁₂	80	40	40	ZnSO ₄	26.1	38.1
CD (P = 0.05)				@ 25 kg/ha	1.4	1.2

Table 2. Fertilizer requirement of *gobhi sarson* under constraints of irrigation in Hoshiarpur district during 1989-90

	Nutrient (kg/ha)			Seed yield (q/ha)
	N	P ₂ O ₅	K ₂ O	
T ₁	0	0	0	3.9
T ₂	75	0	0	6.0
T ₃	100	0	0	6.9
T ₄	125	0	0	7.9
T ₅	75	30	0	8.2
T ₆	100	30	0	9.3
T ₇	125	30	0	10.4
T ₈	75	30	30	9.3
T ₉	100	30	30	11.0
T ₁₀	125	30	30	12.0
T ₁₁	100	45	30	12.1
T ₁₂	125	45	30	13.3
CD (P = 0.05)				0.72

was attained with N₈₀ P₄₀ K₄₀ + Zn₂₅ which was significantly more than rest of the treatments (Table 1). The inclusion of azotobacter inoculation alone also was found

beneficial and it resulted in an increase of 1.1-1.6 q/ha of increased maize yield, depending on level of NPK dose; its effect being more pronounced with higher level of

fertilization than at lower level. Thus, for highest yields of maize under moisture-constraint condition even, a balanced dose of $N_{80} P_{40} K_{40}$ along with Zn_{25} (38.1 q/ha), and azotobactor inoculation also to improve the wheat yields but lesser than Zn (Table 1). This suggests that on soil of medium moisture retentivity, both maize and wheat need adequate fertilization with balanced NPK, suitability with Zn; and that practice of using azotobactor along with NPK could also be encouraged to get added benefits of 1.0–1.5 q/ha yield with nominal cost of culture treatment.

Gobhi sarson showed good performance under a higher fertilizer dose ($N_{125} P_{45} K_{30}$) than the recommended dose ($N_{100} P_{30} K_{30}$), with a yield margin of 2.3 q/ha. This

indicates that the crop would need in general a higher dose (Table 2). Singh (1989) also reported higher fertilizer need of *gobhi sarson* for high yield realization. This crop shows particularly good performance under submontane climate due to relatively higher humid conditions available in this region.

The results on farmers' field thus confirm the benefit of using recommended balanced levels of fertilizer both under irrigated and condition of moisture constraint.

REFERENCE

- Singh, M. 1989. 'Growth and yield of *Gobhi Sarson* (*Brassica napus* L.) under various irrigation schedules and rates of nitrogen.' Ph. D. thesis, Punjab Agricultural University, Ludhiana (Unpublished).

Indian J. Agron. 38 (3) : 465–467 (September 1993)

Effect of different seed rates and implements used for interculture operation in rainfed rice (*Oryza sativa*)

G. K. SHRIVASTAVA AND R. S. TRIPATHI

Department of Agronomy, Indira Gandhi Krishi Vishwa Vidyalaya, Raipur,
Madhya Pradesh 492 012

Received: July 1992

The initial seed rate as well as the type of implements used affects the interculture operation (*biasi*), which in turn affects the plant stand in the field. Hence an experiment was carried out to evaluate the effect of different seed rates and implements used for interculture operation in rice (*Oryza sativa* L.).

The field experiment was conducted at Raipur during the rainy season of 1991 on silty clay loam soil of pH 6.94. The soil had available N 22.4 kg/ha, available P_2O_5 8.19 kg/ha and K_2O 364 kg/ha. The experiment was laid out in split-plot design with 15 treatments, comprising 3 implements (Navagaon plough, *desi* plough with blunt