Indian Journal of Agronomy **46** (3) : 400–403 (September 2001)

Effect of rainy-season crops on production potential of succeeding wheat (*Triticum aestivum*)

B.S. KUMPAWAT

Agriculture Research Station, Maharana Pratap University of Agriculture and Technology, Arjia, Bhilwara, Rajasthan 311 001

Reeeived: August 2000

ABSTRACT

A field experiment was conducted during 1993–94 and 1995–96 at Agriculture Research Station, Arjia, Bhilwara, to evaluate the residual effect of maize (*Zea mays* L.), cowpea [*Vigna unguiculata* (L.) Walp.] and their intercrop on succeeding wheat (*Triticum aestivum* L. emend. Fiori & Paol.). Maize grain-equivalent yield increased by 14.41 q/ha in maize + cowpea (fodder) intercropping system. Yield of succeeding wheat increased by 8.44 q/ha with incorporation of cowpea (fodder) in cropping system over maize–wheat system. The highest net returns (Rs 23,292/ha), benefit : cost ratio (3.1) and wheat-equivalent yield (67.88 q/ha) were obtained from maize + cowpea (fodder)–wheat cropping system. Wheat responded to nitrogen significantly up to 120 kg N/ha.

Key words : Cropping system, Production potential, Economy, Wheat

Fertilizer is one of the costliest inputs in the crop production. Hence it is very important to find out the way of economy in the use of fertilizers. Incorporation of legumes in cropping systems improves nitrogen status of soil and help in increasing the yield of succeeding cereal crops and increased returns per unit area and time (Ahlawat *et al.*, 1981; Balyan, 1997). Further, fodder legumes are more potent in increasing the productivity of succeeding cereals due to their removal from the field when the nitrogen fixation in nodules is at their peak (Balyan and Seth, 1989). Keeping this in view, the present investigation was carried out to study the effect of legume alone and as an intercrop on production potential of succeeding wheat at different nitrogen levels.

MATERIALS AND METHODS

A field experiment was carried out during the rainy and winter seasons of 1993–94 to 1995–96 at Agriculture Research Station, Arjia, Bhilwara (Rajasthan), to determine the residual effect of maize, cowpea and their intercropping on succeeding wheat under irrigated conditions. The soil was sandy loam, having pH 8.3, electric conductivity 0.38 dS/m, organic carbon

0.41%, available N, P and K 195.3, 10.2 and 182.1 kg/ha respectively. Six rainy-season cropping systems were tried in randomized block design and the plots were split into 3 parts and levels of nitrogen were applied in winter season (Table 1) with 4 replications. Fertilizer dose of 17.5 kg P/ha was applied to all the rainy and winter season crops, whereas 120 and 20 kg N/ha was given to maize and cowpea respectively. The varieties sown were maize 'Navjot', cowpea 'RC 19' and wheat 'Lok 1'. Maize and cowpea removed from the field for green fodder, 50 days after sowing.

RESULTS AND DISCUSSION

Maize grain-equivalent yield increased by 14.41 and 16.08 q/ha when cowpea was intercropped for fodder compared with maize and cowpea alone respectively (Table 2).

Among the different cropping systems, significantly maximum grain (41.20 q/ha) and straw (53.97 q/ha) yields of wheat was obtained when it was preceded by cowpea fodder (Table 2). Compared with all other cropping systems perceptible lower wheat grain (32.76 q/ha) and straw (41.71 q/ha) yields were recorded under maize–wheat system. The results confirm the findings of Balyan and Seth (1989). This shows the beneficial residual effect of legume on the succeeding wheat crop. All growth and yield-contributing characters of wheat were significantly improved by different rainy-season crops as compared to maize–wheat system, and maximum values were

Table 1. Effect of rainy-season and nitrogen dose on growth and yield attributes of wheat (pooded over 3 years)

Treatment	Plant height (cm)	Ears/m row length	Ear length (cm)	Grains/ ear	1,000-grain weight (g)
Rainy-season crops					
Maize	74.0	63.6	7.1	32.5	48.18
Cowpea	76.0	68.1	8.3	36.0	50.29
Cowpea (F)*	78.4	71.3	8.8	38.4	48.66
Maize + cowpea	75.3	67.2	8.2	33.5	49.28
Maize + cowpea (F)*	76.9	70.3	8.6	36.2	48.26
Cowpea (SI)*	77.0	68.9	8.4	35.9	48.52
CD (P=0.05)	1.04	1.10	0.15	0.66	0.78
N kg/ha to wheat					
40	74.3	62.6	8.0	33.7	49.86
80	76.8	68.5	8.4	35.5	48.89
120	77.7	72.5	8.7	37.0	47.83
CD (P=0.05)	0.66	0.58	0.10	0.36	0.42

*F, Fodder; SI; straw incorporation

Table 2. Effect of treatments on yield, return and benefit : cost ratio (mean data of 3 years)

Treatment	Maize-equivalent yield (q/ha)	Wheat yield (q/ha)		Benefit : cost ratio	Net return (Rs/ha)	Wheat-equivalent yield of different systems (q/ha)
		Grain	Straw			
Cropping system						
Maize–wheat	17.30	32.76	41.71	2.4	17,351	48.80
Cowpea–wheat	15.63	36.18	46.03	2.9	19,470	50.67
Cowpea (F)–wheat	11.04	41.20	53.97	3.0	19,665	51.44
Maize + cowpea–wheat	17.84	34.35	45.08	2.5	18,465	50.89
Maize + cowpea (F)–wheat	31.71	38.48	50.16	3.1	23,292	67.88
Cowpea (SI)–wheat	15.56	39.96	48.13	2.8	18,558	51.39
CD (P=0.05)	1.94	0.75	1.52			
N kg/ha to wheat						
40		32.41	41.40	2.6	17,327	
80		37.64	49.01	2.8	19,992	
120		39.97	52.19	2.9	21,082	
CD (P=0.05)		0.49	0.66			

recorded in the cowpea (fodder)–wheat system except 1,000-grain weight which was highest in the cowpea–wheat system (Table 1.)

The grain and straw yields varied significantly with N levels (Table 2). The increase in grain yield due to 120 kg N/ha over 40 and 80 kg N/ha was 23.3 and 6.2% respectively, while the increase in straw yield due to 120 kg N/ha over 40 and 80 kg N/ha was 26.1 and 6.5% respectively. The yield increased being basically owing to significantly higher number of ears/running m, ear length and grains/ear (Table 1). Singh *et al.* (1997) also reported similar results. However, 1,000-grain weight declined probably due to increase in grains/ear which in turn caused depression in size of grain. Yadav and Verma (1991) opined similar view.

The net return, benefit : cost ratio and wheat-equivalent yield of different cropping systems varied with the various treatments. However, the data were not analysed. The net return, benefit : cost ratio and wheat-equivalent yield obtained from different cropping systems were higher than maize alone (Table 2). Maximum net returns (Rs 23,292/ha), benefit : cost ratio (3.1) and wheat-equivalent yield (67.88 q/ha) were recorded from maize + cowpea (fodder)–wheat system. Each increasing level of N up to 120 kg/ha increased the net return and benefit : cost ratio.

REFERENCES

Ahlawat, I.P.S., Singh, A. and Saraf, C.S. 1981. Effect of winter legumes on the nitrogen economy and productivity of succeeding cereal. *Experimental Agriculture* **17** : 57–62.

Balyan, J.S. 1997. Production potential and nitrogen uptake by succeeding wheat (*Triticum aestivum*) under different cropping sequences. *Indian Journal of Agronomy* **42**(2) : 250–252.

Balyan, J.S. and Seth, Jagdish. 1989. Effect of cropping systems on maize production and their residual effect on succeeding wheat. *Indian Journal of Agronomy* **34**(1) : 57–60.

Singh, V.P.N., Singh, S.C. and Uttam, S.K. 1997. Response of wheat (*Triticum aestivum*) varieties to nitrogen under late-sown condition. *Indian Journal of Agronomy* **42**(2) : 282–284.

Yadav, G.L. and Verma J.K. 1991. Effect of irrigation regime, nitrogen and zinc fertilization on growth and yield of late-sown wheat (*Triticum aestivum*). *Indian Journal of Agronomy* **36** (1) : 50–56.