Madras Agric. J., 85(7-9): 400 - 403 July - September 1998
https://doi.org/10.29321/MAJ.10.A00768

PERFORMANCE OF MAIZE (*Zea Mays*) AND WHEAT (*Triticum aestivum*) IN SEQUENCE WITH COMPLEMENTARY USE OF FYM AND FERTILIZERS UNDER RAINFED CONDITIONS

RAMESHWAR and C.M. SINGH
Department of Agronomy
College of Agriculture
Palampur

ABSTRACT

Results of three year field study (1993-96) on the performance of maize and wheat crops with different treatments of FYM and fertilizers revealed that cumulative effect of FYM during all the crop seasons in maize and wheat and direct effect of FYM on maize in the first year of experimentation performed better over rest of the treatments and ultimately reflected on the grain yield of the crops. Application of 50% of recommended NPK to both maize and wheat crop is beneficial for getting maximum benefit cost ratio.

KEY WORDS : Rainfed, FYM, Fertilizers, Complementary, Economics

The application of inorganic fertilizers accounts for about 40-50 % of the world agricultural production. The rapid spurt in the use of inorganic fertilizers is due to the quick yield responses to their application. However, the cost of non-renewable petroleum and its product has risen sharply during the last decades and escalating further during the current decade (Dudal, 1980). Hence reduction in the use of chemical fertilizer is necessary not only for reducing the cost of production but also for maintaining higher productivity for sustainable agriculture in rainfed areas of maize-wheat sequence. The complementary use of organic and inorganic sources of plant nutrients will also be helpful in mitigating the problem of soil health, if any, on long terms basis vis-a-vis to sustain the productivity of the system. The objective of the present study was to assess the extent of economization of fertilizer requirement of maize-wheat sequence through schedule of application of FYM and fertilizers under rainfed condition by determining the treatment effect on progressive growth, development and yield of maize and wheat crops grown in sequence.

MATERIALS AND METHODS

A field experiment was carried out at the Agronomy farm of Himachal Pradesh Krishi, Vishvavidyalaya, Palampur during 1993-96. The soil of the experiment field was silty clay loam having a pH of 5.6 with 0.64 per cent organic carbon and 284, 16.8 and 275.3 kg/ha available N,P and K respectively. The experiment was laid out in randomised block design in *Kharif* 1993. The treatment consisted of three doses and schedule of fertilizer application (100% recommended NPK to maize and 50% recommended NPK to wheat, 75% recommended NPK to maize and 75% recommended NPK to wheat and 50% recommended NPK to maize and 100% recommended NPK to wheat) and three FYM treatments (FYM to maize, FYM to wheat and FYM to both). However, during the first maize crop season 1993, there were only two FYM treatments viz., application of FYM to maize crop and no FYM to maize crop. In subsequent seasons, all the three levels of FYM were applied. FYM was incorporated @ 10 t/ha on dry weight basis in the soil as per the treatment. The whole quantity of FYM, P and K was applied as basal dose to crops. In maize crop 1/3 rd nitrogen was applied at sowing 1/3 at knee high and remaining 1/3 rd at tasseling stage. Whereas in wheat crop half of N was applied at sowing and remaining half dose was applied at tillering stage. The maize and wheat crops were fertilized with the recommended dose of 120:60:40 and 80:40:40 N, P_2O_5 and K_2O respectively. The N, P and K were applied through urea, single super phosphate and muriate of potash respectively. The maize crop variety Parvati was sown under rainfed conditions at spacing of 60 x 20 cm on 19th May 1993, 28th May 1994 and 19th June 1995 and the soil moisture at the time of sowing was 22.3, 21.8 and 22.7% respectively. The total rainfall received in maize crop season during different years was 1261, 1689 and 1561 mm

respectively. The wheat crop variety VL - 616 was sown at 22 cm spacing on 6th Oct. 1993, 28th Oct. 1994 and 9th October 1995 and the soil moisture at the time of sowing was 21.2, 18.1 and 18.8 % respectively. The total rainfall received in wheat crop seson during different years was 290, 296, and 218 mm respectively.

RESULTS AND DISCUSSION

Performance of Maize with FYM

Application of FYM to both crops significantly increased the plant height, dry matter accumulation and light interception. The direct effect of FYM to maize resulted in improvement in plant height and dry matter accumulation over residual effect of FYM, whereas light interception did not vary significantly with direct and residual effect of FYM (Table 1). The response of the maize to direct effect of FYM over residual effect might be attributed to mitigate the fertilizer demand of the crop, because of the use of lower doses of chemical fertilizers. The application of FYM increased the grain yield over no FYM application during first year of experimentation. Significantly higher grain yield was obtained with cumulative effect of FYM, followed by direct effect and lowest yield was obtained with residual effect of FYM during all years of experimentation. Similar results were found in the long term experiment of maize and wheat under Model Agronomic Project at Ludhiana over the years (1968-78) (Nambiar, 1994).

Performance of maize with different scheduling of fertilizers

The increase in fertility levels in maize increased all the growth parameters with the increased level of fertility where as lower fertility levels F50 and F75 did not differ significantly. Adequacy of moisture and congenial temperature for growth of maize might have helped in better utilization of nutrients even at lower levels of fertilizer application. The application of 100% recommended NPK produced significantly high grain yield during first year of experimentation. In the subsequent years and in the pooled analysis, F75 remained at par with F100 and F50 of recommended NPK. F50 recorded the lowest grain yield during different years of experimentation except second year (Table 1).

Performance of wheat with FYM

Application of FYM to maize and wheat referred to as cumulative effect proved better than direct or residual effects which ensured ample supply of nutrients and favour growth and environment to the crops. The results are in confirmatory with findings of Singh and Mehta (1982). The non significant differences in direct and residual effect of FYM in wheat crop might be attributed to the well decomposition of FYM along with lower dose of chemical fertilizers in maize season which became available to the succeeding wheat crop. Cumulative application of FYM (application of FYM to maize and wheat) improved the grain yield of wheat crop followed by direct

Table 1. Effect of different FYM application, doses and scheduling of fertilizers on growth parameters and yield of maize crop.

	Plant height at harvest (cm)			Dry matter accumulation at harvest (g/m^2)			Light Interception at harvest (%)			Grain yield (q/ha)			
	1993	1994	1995	1993	1994	1995	1993	1994	1995	1993	1994	1995	Pooled
Effect of FYM													
FYM to maize	229.5	217.1	212.3	1287.1	1130.0	1118.2	72.9	78.6	78.1	54.7	44.9	41.5	43.2
FYM to wheat	221.9	200.5	199.3	1140.7	958.4	1057.3	66.5	81.1	80.0	44.7	38.7	35.5	37.1
FYM to both	-	226.9	220.3	-	1188.0	1171.4	-	85.0	88.2	-	48.6	45.9	47.7
SEm ±	1.83	3.26	1.28	2.19	4.26	9.01	1.35	1.06	0.99	0.98	1.23	1.31	0.89
CD P = (0.05)	5.76	9.78	3.84	6.94	12.79	27.02	4.25	3.18	2.97	3.10	3.69	3.94	2.56
Effect of doses and scheduling of fertilizer													
F 100%	224.4	222.6	215.0	1314.0	1161.0	1144.0	82.1	85.0	82.1	56.1	44.9	43.2	44.53
F 75%	228.2	213.2	209.8	1237.0	1079.2	1124.0	76.2	81.1	81.2	51.4	44.6	41.1	42.63
F 50%	235.4	208.7	207.3	1154.0	1036.0	1078.0	72.0	78.6	78.0	48.3	42.8	38.7	40.72
SEm ±	1.95	3.26	1.28	2.65	4.26	9.01	1.78	1.06	0.99	1.23	1.23	1.31	0.89
CD P = (0.05)	5.86	9.78	3.84	7.96	12.78	27.02	5.34	3.18	2.97	3.70	NS	3.93	2.56

Table 2. Effect of different FYM application, doses and scheduling of fertilizers on growth parameters and yield of wheat crop.

	Plant height at harvest (cm)			Dry matter accumulation at harvest (g/m^2)			Light Interception at harvest (%)			Grain yield (q/ha)			
	1993	1994	1995	1993	1994	1995	1993	1994	1995	1993	1994	1995	Pooled
Effect of FYM													
FYM to maize	97.5	101.0	100.4	750.4	768.2	764.2	50.0	45.3	63.9	87.5	29.6	30.5	29.2
FYM to wheat	99.5	102.8	101.0	819.1	815.1	804.2	71.6	48.6	65.1	31.6	32.5	33.4	32.5
FYM to both	103.6	106.1	106.2	866.8	962.2	909.8	75.5	69.6	73.2	34.5	38.4	37.4	36.7
SEm	0.69	0.63	1.34	11.71	23.97	20.33	2.12	2.31	2.31	0.91	0.99	0.97	0.67
CD P = (0.05)	2.08	1.89	4.08	35.11	71.77	61.82	6.35	6.92	7.03	2.74	2.98	2.95	2.01
Effect of doses and scheduling of fertilizer													
F 50%	98.7	102.2	100.9	813.7	827.8	814.7	67.8	54.0	65.0	28.9	31.4	32.1	30.8
F 75%	101.4	103.5	102.3	815.6	841.0	828.9	68.1	57.1	66.4	30.5	33.3	38.4	32.4
F 100%	100.5	104.2	104.3	826.9	877.5	834.7	61.4	54.4	71.0	34.2	35.7	35.8	35.2
SEm	0.69	0.63	1.34	11.71	23.97	20.33	2.12	2.31	2.31	0.91	0.99	0.97	0.67
CD P = (0.05)	2.08	NS	NS	NS	NS	NS	6.35	NS	NS	2.74	2.98	2.95	2.01

effect of FYM (application of FYM to wheat crop) and lowest yield was obtained with residual effect of FYM (application of FYM to maize crop), whereas during second and third years of experimentation of wheat crop, there was no difference between direct effect of FYM and residual effect of FYM (Table 2) which might be attributed to the improvement in soil conditions and build up of soil nutrient etc.

Performance of wheat with different scheduling of fertilizers

The different growth parameters recorded at maturity and at heading stage did not differ significantly might be due to the limitation of moisture and temperature. The significance of number of grains/spike, grain weight per spike and yield response was found with increase in fertilizer application. During the subsequent years 75% recommended NPK was at par with both F50 and F100, where as F50 recorded lowest yield because of deficiency of essential nutrient elements. Due to small increment in fertility levels, F50 and F75 remained at par with each other, whereas application of recommended NPK produced significantly higher growth, development, yield attributing characters and ultimately yield over 50% of recommended NPK fertilizers (Table 2).

Economics :

Maize :

The data presented in Table. 3 clearly showed that cumulative effect of FYM produced higher gross as well as net return followed by direct effect and lowest with residual effect. Maximum benefit cost ratio was obtained with application of FYM to preceeding wheat crop.

Increase in fertility levels also increased the gross as well as net return. But maximum benefit cost ratio was obtained with lowest dose (50%). The results are in confirmatory with Negi *et al.*, (1992).

Table 3. Average values of gross return, net return and benefit - cost (BC) ratio

MAIZE Average values of 1994 & 1995				WHEAT Average values of 1993-94, 1994-95 & 1995-96			
Treatment	Gross return (Rs.)	Net return (Rs.)	B:C ratio	Treatment	Gross return (Rs.)	Net return (Rs.)	B:C ratio
Effect of FYM							
FYM to Maize	28031	18337	2.89	FYM to Maize	17393	10977	2.70
FYM to wheat	23551	16307	3.26	FYM to wheat	19221	10339	2.16
FYM to Both	30555	20794	3.15	FYM to Both	21687	12826	2.44
Effect of doses and scheduling of fertilizers							
F 100%	28619	19140	3.03	F 50%	18616	10981	2.47
F 75%	27542	18598	3.11	F 75%	19208	11165	2.41
F 50%	25976	17700	3.15	F 100%	20476	11996	2.43

Wheat :

Gross return in this crop behaved similar to maize crop but net return and benefit cost ratio with residual effect of FYM was more as compared to the direct effect.

Increase in fertility levels increased the gross as well as net return but maximum benefit cost ratio was obtained with lowest fertility level. (Table 3)

REFERENCES

DUDAL, R. (1980). Fertilizers for food production in developing countries. **Fert. News. 25(7) :** 40-46.

NAMBIAR, K.K.M. (1994). Long term fertilizer experiments in India. In Soil fertility and crop productivity under long term fertilizers in India. **ICAR Publication, New Delhi,** PP. 24-30.

NEGI, S.C., SINGH, K.K. and THAKUR, R.C. (1992). Economics of phosphorus and farmyard manure application in wheat (*Triticum aestivum*) maize (*Zea mays*) sequence. **Indian. J. Agron. 37(1):** 30-33.

SINGH, VED and MEHTA, M.L.K. (1982). Manurial requirement of maize- wheat rotation. **Indian J. Agron 27(2) :** 127-136.

(Received : December 96 Revised : December 98)

Madras Agric. J., 85(7-9): 403 - 405 July - September 1998

EFFECT OF SUGAR FACTORY EFFLUENT ON GROWTH, YIELD AND QUALITY OF BHENDI - VAR PKM-1

A. RATHINASAMY and C.R. LAKSHMI NARASHIMHAN

Department of Soil Science and Agricultural Chemistry
Agricultural College and Research Institute
Madurai - 624 105.

ABSTRACT

A field experiment was conducted to study the effect of sugar factory effluents on growth, yield and quality of bhendi-var PKM 1 in the premises of a sugar factory in Aundipatti, Madurai District. The crop quality was not affected. Increased yields were obtained with 50% and 75% dilutions when compared to zero per cent dilution. There was no adverse effects on the soil physical properties. The effluent can be used for irrigating bhendi with proper dilution.

KEY WORDS : Sugar factory effluent, quality of bending soil physical properties.

In order to meet the production needs in agriculture, the Government of India's working group on fertilizers has estimated that 20.6 mt. of nitrogen, phosphorus and potassium may be required by 2000 A.D. On no account fertilizers, or any single input can provide such large quantities of plant nutrients. All available nutrient sources have to be tapped to meet the target. In addition, integrated use of mineral, organics and usable wastes is necessary for sustaining high crop yields. Based on these lines, an experiment was conducted, on the utilization of sugar factory effluent and its effect on growth, yield and quality of bhendi var PKM-1.

MATERIALS AND METHODS

A field was selected adjacent to the premises of a sugar factory in Aundipatti, Madurai District. The soil characters were as follows :

Initial soil characteristics

1.	Soil reaction (pH)	:	7.2
2.	Electrical conductivity	:	0.28 dSm^{-1}
3.	Bulk density	:	1.34 Mg/m^3
4.	Particle density	:	2.14 Mg/m^3
5.	Maximum water holding capacity (MWHC)	:	26.54%
6.	Pore space	:	45.76%
7.	Volume expansion	:	11.77%
8.	Organic carbon	:	1.07%
9.	Organic matter	:	1.84%
10.	Available nitrogen	:	284 kg ha^{-1}
11.	Available phosphorus	:	19.5 kg ha^{-1}