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Phosphorus and zinc management with bio-fertilizers on yield and nutrient uptake of wheat (*Triticum aestivum* L.)

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ABSTRACT

A field experiment was conducted to examine interactive effect of phosphorus (P_1: No RDP, P_2: 50 % RDP , P_3:100 % RDP) and Zn (Z_1: No $ZnSO_4$/ha, Z_2: 10 kg $ZnSO_4$/ha Z_3: 20 kg $ZnSO_4$/ha) with bio fertilizers (B_1: PSB, B_2: VAM (native mixture) and B_3: PSB + VAM) on wheat yield, quality and soil properties during 2010-11 2011-12 2012-13 and 2013-14. Experiment was laid out in split plot design with 3 replications. Results showed that soil and plant P concentration and uptake significantly improved with increase in P application rate at each Zn level and decreased with increasing rate of Zn application. Application of P and zinc with bio-fertilizers significantly increased Treatment P_3: (100 % RDP) recorded significantly higher grain yield during pooled (47.87 q/ha) and zinc levels by zinc Z_3: (20 kg $ZnSO_4$/ha) in pooled (47.79 q/ha) over Z_1: (No Zinc), phosphorus uptake by wheat (Var. GW 322) significantly as 30 kg P_2O_5/ha with B_3: (PSB + VAM) PSB @ 30 gm/1 kg as a seed treatment + 20 kg/ha inoculated VAM (Native) culture. Similarly, soil and plant Zn concentration and uptake increased with increasing Zn application however at each Zn rate Zn uptake decreased by increasing application rate of P. Soil and wheat Zn and P concentration and uptake showed more significant response at 30 kg P_2O_5 ha^{-1} applied in combination with 10 kg Zn ha^{-1} with B_3: (PSB + VAM) PSB as a seed treatment + 20 kg/ha inoculated VAM (Native) culture is useful under the Sandy loam soils for obtaining improved wheat yield and soil properties.

Key words: Bio-fertilizer, phosphorous, zinc, wheat

Intensive and multiple cropping cultivations of crop varieties with heavy nutrient requirement and unbalanced use of chemical fertilizers especially nitrogen and phosphorus fertilizers reduced quality of grain production and the appearance of micronutrient deficiency in crops. Both P and Zn are important for good yield although they are antagonistic in nature to each other. High P availability may depress Zn concentrations in plant, increase requirement for Zn, results in accumulation of toxic levels of P in the leaves when Zn levels are low. Microbial inoculants i.e. VAM or PSB bio-fertilizers are important to nourish the crop yield. It produces hormones, vitamins and amino acids and control plant pathogens. Thus, neither the organic alone nor the chemical fertilizers can achieve the yield sustainability where the nutrient depletion and turnover in soil plant systems is remarkable. Due to scanty information of P x Zn interactions with bio-fertilizers, in the literature, study was conducted on Phosphorus and zinc management with bio-fertilizers on yield and nutrient uptake of wheat (*Triticum aestivum* L.).

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MATERIALS AND METHODS

The experiment was conducted in sandy loam soils at having low organic carbon, medium in fertility status with neutral soil reaction. The

objective of the study was to find out the optimum dose of phosphorus and zinc with or without bio-fertilizers. Source of Bio-fertilizer (B_1: PSB, B_2: VAM (native mixture) and B_3: PSB + VAM), levels of Phosphorus (P_1: No RDP, P_2: 50 % RDP , P_3:100 % RDP) and levels of Zinc (Z_1: No $ZnSO_4$/ha, Z_2: 10 kg $ZnSO_4$/ha Z_3: 20 kg $ZnSO_4$/ha) applied on wheat Var. GW 322 with 3 replication in Split Plot Design. The initial EC (1:2.5) was 0.21 dS/m, pH (1:2.5) 7.60, O.C. 0.24 %, Available N (153 kg/ha), P_2O_5 (33.40 kg/ha) and K_2O (290 kg/ha). Also applied common 120 kg/ha N/ha to all treatments and it was splitted as 1/3rd nitrogen at basal + 1/3rd at first irrigation + 1/3rd at second irrigation. The PSB @ 30 gm/1 kg as a seed treatment + 20 kg/ha inoculated VAM were applied in this study.

RESULTS AND DISCUSSION

Grain yield

The effect of PSB as a seed treatment + 20 kg/ha inoculated VAM with RDP increase both grain yield of the wheat by 7.9 to 13.5% as compared to control and by 10 kg $ZnSO_4$ the increased by 0.2 to 7.7% as compared to no application of the $ZnSO_4$. Whereas, Bio-fertilizers application recorded higher grain yield in the year 2010-11(57.06 q/ha), 2011-12(39.63 q/ha), 2012-13 (52.44 q/ha), 2013-14(45.89 q/ha) and (48.75 q/ha ha), however, it was at par with B_2: (VAM) treatment except, in 2011-12.

Among phosphorus levels on grain yield, treatment P_3:(100 % RDP) recorded significantly higher grain yield during 2011-12(38.33 q/ha), 2013-14 (46.65 q/ha) and in pooled (47.87 q/ha) analysis, however, it was at par with treatment P_2: (50% RDP) over treatment P_1: (43.92 q/ha) i.e. No phosphorus (Table-1).

An appreciable improvement in Soil OC (6.1%), available nitrogen (3.1%), available phosphorus (4.9%) and available potash (2.8%) was observed with P_3: 100 % RDP and Soil OC (6.1%), available phosphorus (2.1%) and available potash (0.5%) were higher with Z_3: 20 kg $ZnSO_4$/ha application than control. Although, the different levels of RDP didn't show any effect on nitrogen and phosphorus uptake by wheat.

Effect of zinc levels on grain yield was significant except, in 2010-11. Yield was in 2011-12 (40.49 q/ha), 2012-13 (50.66 q/ha), 2013-14 (45.98 q/ha) as well as in pooled (47.79 q/ha) result with Z_3:(20 kg $ZnSO_4$/ha) over Z_1:(No Zinc) i.e. 35.86, 48.69, 43.81 and 45.68 q/ha respectively.

Interaction between all the combinations on grain yield were found to be non significant, except, Y x P interaction.

Straw yield

Effect of Bio-fertilizer: indicated that the differenceson straw yield was significant by bio-fertilizer, except, 2011-12 and 2013-14. Straw yield was significantly higher with B_2:(VAM) treatment in 2010-11 (111.03 q/ha), in 2012-13 (87.05 q/ha) as well as in pooled analysis (77.44 q/ha). However, it remained at par with B_1: (PSB) in pooled analysis (73.02 q/ha) as results found by Mehrvarz *et al*., (2008).

Effect of P levels was non-significant on straw yield of wheat. In pooled analysis higher straw yield of 75.00 q/ha was recorded with P_3:(PSB + VAM) treatment (Table-2). The data (Table S-2) indicated that effect of zinc levels on straw yield of wheat was found to be non-significant, except, in 2011-12. Treatment Z_1: (No zinc) produced 53.42 q/ha straw yield which was significantly highest over the other tretments.

Interaction effect due to bio-fertilizers, P and Zinc levels were found to be non significant, except, B X P interaction was significant on straw yield in pooled analysis (Table -2).

Ancillary parameters

Plant height (Table -3) was found significant effect due to bio-fertilizer only in pooled result. However, B_2: (VAM) and B_3: (PSB + VAM) recorded higher plant height than B_1:(PSB). Treatment Z_3: (20 Kg $ZnSO_4$/ha) recorded higher plant height than Z_1: (No zinc) In contrast to growth Fageria *et al.,* (2008) that number of tillers was found non significant effect due to bio-

fertilizer, phosphorus and zinc levels in individual years as well as in pooled results, as results revealed in this study (Table-3).

Earhead/m^2 was found non-significant effect due to bio-fertilizer,phosphorus and zinc levels. On an average treatment B_3:(PSB + VAM) recorded higher earhead/m^2 than B_1: (PSB). Test weight (Table-3) was non significant due to bio-fertilizers, of P and zinc levels.

Effect on grain quality characters

Perusal of data presented in Table-4, supported the earlier finding of that In pooled analysis, significantly higher protein content (12.40 %) was recorded by application of B_1: (PSB), however, it was at par with B_3: (PSB + VAM) i.e. 12.1%. Effect of different bio-fertilizer was significant effect on gluten content and sedimentation value only. Significantly higher gluten (29.3 %) was recorded in treatment B_1:(PSB). Significantlly higher sedimentation value (37.7) was recorded by treatment B_3:(PSB + VAM). But treatment Z_3: 20 kg $ZnSO_4$/ha and Z_2:10 kg $ZnSO_4$/ha remained at par.

Effect on soil properties

Content in soil

Bio fertilizer levels was found significant on pH, EC, organic carbon and available phosphorus. Significantly higher pH (7.61) and OC (0.36%) was recorded with B_2: (VAM) due to produce phytohormones against phytopathogenic microorganisms by production of siderophores, the synthesis of anti-biotics, enzymes and/or fungicidal compounds and also solubilization of mineral P and other nutrients. Thus microbes fix, solubilise and mobilize P and translocation of zinc to the plants, however it was at par with B_1: (PSB). Treatment B_3: (PSB + VAM) recorded significantly higher pH and available phosphorus in soil (39.42 kg/ha), but it remaimed at par with B_2: (VAM) treatment. Similar results were also recorded by Faujdar *et al.*, (2013) and Jaga and Upadhyay, (2013) and Vyas, et al., (2012) that effect of incubation influenced the productivity and available nutrient status due to hyphae of the arbuscular mycorrhizae expand the absorption region of the wheat roots and enhanced the absorption, regulation of stomata apparatus, increase in activity of antioxidant enzymes and absorption of nutrients, particularly P. Effect of bio-fertilizers on nitrogen and potash content in soil was non-significant (Table 5).

Effect of phosphorus levels

Treatment P_2: (50% RDP) recorded significantly higher pH (7.55) and organic carbon (0.35%) in pooled analysis, however, it was at par with P_3: (60 kg $ZnSO_4$/ha) in both the cases. Significantly higher organic carbon was recorded under treatment P_2:(50% RDP), however, it was at par with treatment P_1: (No phosphorus). Significantly higher available nitrogen (188.50 kg/ha) and available phosphorus (38.85 kg/ha) in soil was recorded under treatment P_3:(100% RDP). The results of Jaga, and Upadhyay (2013) and Monasterio *et al.,* (2002) were conferred due to solubilization of mineral phosphates through microbes solubilise and mobilize phosphorus and translocation of zinc to the soil to plants system.

Effect of Zinc levels

Zinc levels was significant effect on EC, organic carbon and available phosphorus (Table-4). Treatment Z_3:(20 kg $ZnSO_4$/ha) recorded signifintly higher Ec (0.22 dS/m), organic carbon (0.35 %) and available phosphorus in soil (38.51 kg/ha), however, in case of organic carbon content it was at par with Z_2: (10 kg $ZnSO_4$/ha).

Interaction effect

Interaction effect on content in soil on Soil pH, EC, Organic carbon and available nitrogen were significantly affected by B x P and B X P X Z interactions. Whereas, B x Z interaction was significant on soil pH, EC, OC and available phosphorus content in soil. (Table-5).

Nutrient uptake by grain and straw

Apart from Data in Table-5 Components of

nutrients-use efficiency by legume-wheat sequences reported by Prasad et al. (2000). In this study, significantly higher nitrogen uptake (59.66 kg/ha) by grain and phosphorus (22.88 and 15.58 kg/ha) and potash (24.20 and 33.09 kg/ha) by grain and straw were recorded with B_3: (PSB +VAM) treatment respectively.

Effect of Phosphorus levels

Significantly higher K uptake (22.40 kg/ha) by grain was recorded by P_3:(100 % RDP) treatment, However, it was at par with P_2: (50 % RDP).

Effect of zinc levels

Significantly higher P uptake (21.82 kg/ha) by grain was recorded by Z_3 : (20 kg $ZnSO_4$/ha) and K uptake (22.24 kg/ha) by Z_2 : (10 kg $ZnSO_4$/ha) but it was at par with Z_3 : (20 kg $ZnSO_4$/ha) treatment.

Interaction effect

Effect of B X P, B X Z, P x Z and B x P x Z Interaction was found significant on N and P uptake by grain. Hassan *et al.,* (2006) also found the similar results. Effect of B X Z and P x Z Interaction was found non-significant on uptake of N and P by wheat straw (Table -5).

Economics

Economics of the different treatments on pooled basis indicated that highest net return of Rs 61885, 58560 and 60391 per hectare were realized by B_3:(PSB + VAM) 30 kg P_2O_5/ha and 20 kg $ZnSO_4$/ha treatment respectively.It is evident from Table S-6 that maximum net CBR of Rs. 2.02, 1.89 and 1.97 was obtained by B_3:(PSB + VAM), 30 kg phosphorus/ha and 10 kg $ZnSO_4$/ha treatment respectively (Table 6).

CONCLUSION

It is evident from results of wheat that the application of 30 kg P_2O_5/ha with PSB @ 30 gm/1 kg as a seed treatment + 20 kg/ha inoculated VAM (Native mixture) culture and 10 kg $ZnSO_4$/ha (soil application), in addition to recommended dose of nitrogen increased yield and net return. The significant effect on soil properties, wheat grain quality and yield were observed, whereas both the organic and inorganicsources were found compatible towards all interactions under study.

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Table 1 Grain yield of wheat as influenced by bio-fertilizers, phosphorus and zinc levels

Treatments	2010-11	2011-12	2012-13	2013-14	Pooled
Bio-fertilizer					
B_1: PSB	52.47	37.09	46.46	43.02	44.76
B_2: VAM	53.28	38.26	50.04	45.37	46.74
B_3 : PSB +VAM	57.06	39.63	52.44	45.89	48.75
SEm ±	0.82	0.08	0.84	0.53	0.59
CD at 5 %	3.22	0.33	3.31	2.10	1.82
CV %	7.85	5.97	8.82	6.20	7.58
Phosphorus Levels					
P_1 : No Phosphorus	50.27	35.37	48.61	41.41	43.92
P_2: 50% RDP	54.21	40.28	49.18	44.21	46.97
P_3: 100% RDP	56.34	38.33	50.15	46.65	47.87
SEm ±	1.17	0.49	0.56	0.44	0.73
CD at 5 %	NS	1.38	NS	1.26	2.02
Zinc levels					
Z_1 : No Zinc	54.34	35.86	48.69	43.81	45.68
Z_2 :10 kg $ZnSO_4$/ha	54.45	38.62	49.59	44.48	46.79
Z_3 : 20 kg $ZnSO_4$/ha	54.03	40.49	50.66	45.98	47.79
SEm ±	1.17	0.49	0.56	0.44	0.27
CD at 5 %	NS	1.38	1.60	1.26	0.76
CV %	11.20	6.59	5.89	5.15	8.09
Interactions BXPXZ	NS	NS	NS	NS	NS

Table 2 Straw yield of wheat as influenced by bio-fertilizers, phosphorus and zinc levels

Treatments	2010-11	2011-12	2012-13	2013-14	Pooled
Bio-fertilizer					
B_1: PSB	91.76	53.90	86.80	59.61	73.02
B_2: VAM	111.03	46.98	87.05	64.70	77.44
B_3 : PSB +VAM	102.41	45.01	79.21	61.77	72.10
SEm±	3.07	0.41	0.52	1.50	1.76
CD at 5 %	12.05	NS	2.05	NS	4.42
CV %	15.67	22.89	3.22	12.53	14.23
Phosphorus Levels					
P_1 : No Phosphorus	100.41	50.89	85.65	59.21	74.04
P_2: 50% RDP	102.62	47.95	80.27	63.24	73.52
P_3: 100% RDP	102.17	47.06	87.14	63.62	75.00
SEm ±	3.17	1.60	2.18	1.87	2.28
CD at 5%	NS	NS	NS	NS	NS
Zinc levels					
Z_1 : No Zinc	99.57	53.42	86.58	61.43	75.25
Z_2 :10 kg $ZnSO_4$/ha	104.16	46.70	83.27	61.16	73.82
Z_3 : 20 kg $ZnSO_4$/ha	101.48	45.78	83.21	63.49	73.49
SEM ±	3.17	1.60	2.18	1.87	0.86
CD at 5 %	NS	4.55	NS	NS	NS
CV %	16.20	6.59	5.89	5.15	16.00
Interactions BXPXZ	NS	18.74	18.62	NS	NS
B X P					5.48

Table 3 Yield attributing charecters of wheat influenced by bio-fertilizers, phosphorus and zinc levels (Pooled)

Treatment	Plant Stand	Plant height (cm)	Grain/ earhead	Earhead/m^2	No. of Tillers	Test weight g)
Bio-fertilizer						
B_1 PSB	212	93.7	58.0	335	19.1	32.07
B_2: VAM	213	95.1	59.2	349	19.8	32.17
B_3: PSB+VAM	208	95.0	58.7	366	20.1	32.20
SEm±	3.44	0.54	0.96	10.16	0.64	0.47
CD at 5%	NS	1.66	NS	NS	NS	NS
CV (%)	10.73	3.42	9.88	17.41	19.61	8.77
Phosphorus levels						
P_1:NO Phosphorus	217	93.7	58.1	345	19.8	32.26
P_2: 50 % RDP	208	95.1	58.7	350	19.7	32.00
P_3:100 % RDP	209	95.0	59.1	355	19.5	32.19
SEm±	4.66	0.63	1.07	8.35	0.83	0.45
CD at 5%	NS	NS	NS	NS	NS	NS
Zinc levels						
Z_1: No Zinc	211	94.1	58.3	346	19.4	32.29
Z_2: 10 kg $ZnSO_4$ /ha	212	94.7	59.1	356	20.0	31.91
Z_3: 20 kg $ZnSO_4$ /ha	210	95.0	58.5	348	19.6	32.24
SEm±	1.75	0.24	0.40	3.13	0.31	0.17
CD at 5%	NS	NS	NS	NS	NS	NS
CV (%)	12.59	3.47	9.48	12.39	22.03	7.33
Interactions B X P X Z	11.19	NS	NS	20.04	NS	0.39
P X Z	9.69	NS	NS	NS	0.26	NS

Table 4 Quality parameters of wheat as influenced by bio-fertilizers, phosphorus and zinc levels (Pooled)

Treatments	Strach (%)	Gluten (%)	Hectoliter weight	Sedi. value	Hardness (%)	Protein (%)
Bio-fertilizer						
B_1: PSB	63.5	29.3	76.6	36.6	85.7	12.4
B_2: VAM	63.6	28.9	76.5	37.0	86.3	12.0
B_3 :PSB +VAM	63.6	28.9	76.7	37.7	86.1	12.1
SEm ±	0.14	0.15	0.42	0.15	0.42	0.12
CD at 5 %	NS	0.35	NS	0.47	NS	0.27
CV %	1.31	2.95	3.32	2.46	3.00	5.88
Phosphorus levels						
P_1 : NO Phosphorus	63.6	29.1	76.8	37.0	85.7	12.1
P_2: 50% RDP	63.6	29.0	76.7	37.1	86.5	12.2
P_3: 100% RDP	63.5	29.0	76.4	37.3	85.9	12.2
SEm ±	0.10	0.13	0.31	0.21	0.55	0.12
CD at 5 %	NS	NS	NS	NS	NS	NS
Zinc levels						
Z_1 : No Zinc	63.5	29.1	76.5	36.9	86.6	12.3
Z_2 :10 kg $ZnSO_4$/ha	63.5	29.0	76.6	36.9	85.7	12.1
Z_3 : 20 kg $ZnSO_4$/ha	63.5	29.1	76.8	36.9	85.9	12.1
SEm ±	0.04	0.05	0.12	NS	0.21	0.05
CD at 5 %	NS	NS	NS	0.22	NS	0.13
CV %	0.82	2.22	2.11	2.95	3.38	5.27
Interactions BXPXZ	0.02	0.07	0.01	0.01	0.005	0.01

Table 5 Soil properties as influenced by bio-fertilizers, phosphorus and zinc levels (Pooled)

Treatments	pH (1:2.5)	EC(1:2.5) dS/m	O.C. (%)	Av. N (kg/ha)	Av.P_2O_5 (kg/ha)	Av.K_2O (kg/ha)
Bio-fertilizer						
B_1: PSB	7.52	0.22	0.32	183.94	35.60	294.00
B_2: VAM	7.61	0.21	0.36	183.10	38.72	298.33
B_3 : PSB +VAM	7.38	0.22	0.34	187.98	39.42	302.89
SEm ±	0.04	0.002	0.005	1.95	0.4	23.90
CD at 5 %	0.11	0.01	0.01	NS	1.26	NS
CV %	2.83	11.58	7.96	6.31	6.46	48.06
Phosphorus levels						
P_1 : No Phosphorus	7.44	0.22	0.33	182.89	37.05	295.01
P_2: 50 % RDP	7.55	0.21	0.35	183.63	37.82	297.09
P_3: 100 % RDP (DAP)	7.53	0.21	0.35	188.50	38.85	303.13
SEM ±	0.018	0.002	0.004	3.07	0.299	15.630
CD at 5 %	0.05	0.006	0.01	5.52	0.83	NS
Zinc levels						
Z_1 : No Zinc	7.51	0.21	0.33	186.38	37.70	296.57
Z_2 :10 kg $ZnSO_4$/ha	7.49	0.21	0.35	184.95	37.52	300.70
Z_3 : 20 kg $ZnSO_4$/ha	7.50	0.22	0.35	183.69	38.51	297.95
SEM±	0.007	0.001	0.002	1.15	0.112	5.861
CD at 5 %	NS	0.001	0.002	NS	0.31	NS
CV %	1.28	5.36	6.34	8.63	4.09	27.2
Interactions BXPXZ	0.01	0.003	0.001	5.048	NS	NS
B X P	0.04	0.01	0.01	7.38	NS	NS
B X Z	0.01	0.004	0.005	NS	1.04	NS
P X Z	NS	0.005	0.009	NS	0.62	NS

Table 6 Nutrient uptake by grain and straw as influenced by bio-fertilizers, phosphorus and zinc levels on wheat (Pooled)

Treatments	Uptake by grain			Uptake by straw		
	N (kg/ha)	P (kg/ha)	K (kg/ha)	N (kg/ha)	P (kg/ha)	K (kg/ha)
Bio-fertilizer						
B_1: PSB	53.21	18.88	18.53	44.97	14.84	29.72
B_2: VAM	52.16	19.36	21.93	44.73	16.27	36.04
B_3 : PSB +VAM	59.66	22.88	24.20	44.34	15.58	33.09
SEm ±	2.312	0.709	0.859	2.154	0.408	1.426
CD at 5 %	7.12	2.18	2.65	NS	1.26	4.39
CV %	25.21	20.88	23.91	28.9	15.73	25.96
Phosphorus levels						
P_1 : NO Phosphorus	55.64	19.44	19.57	43.09	15.62	32.16
P_2: 50 % RDP	53.98	20.45	22.68	45.20	15.20	31.94
P_3: 100 % RDP	55.42	21.22	22.40	45.74	15.87	34.76
SEm ±	2.593	0.893	0.987	2.227	0.488	1.871
CD at 5 %	NS	NS	2.73	NS	NS	NS
Zinc levels						
Z_1 : No Zinc	55.81	19.59	20.56	45.89	15.62	0.83
Z_2 :10 kg $ZnSO_4$/ha	54.67	19.70	22.24	44.82	15.63	NS
Z_3 : 20 kg $ZnSO_4$/ha	54.56	21.82	21.86	43.32	15.44	25.90
SEm ±	0.972	0.335	0.370	0.835	0.183	0.702
CD at 5 %	NS	0.93	1.03	NS	NS	NS
CV %	24.50	22.79	23.78	25.90	16.31	29.51
Interactions BXPXZ	4.00	1.58	NS	NS	NS	NS

Table 7 Economics of bio-fertilizers, phosphorus and zinc levels on wheat (2013-14 based)

Treatments	Yield (q/ha)		Total income (Rs/ha)	Total cost (Rs/ha)	Net return (Rs/ha)	Net CBR
	Grain	Straw				
Bio-fertilizer						
B_1: PSB	4476	7302	78330	85632	56154	1.90
B_2: VAM	4674	7744	81795	89539	58949	1.93
B_3: PSB+VAM	4875	7210	85313	92523	61885	2.02
Phosphorus Levels						
P_1: No Phosphorus	4392	7405	76860	84264	54834	1.86
P_2: 50 % RDP	4697	7352	82198	89550	58560	1.89
P_3:100 % RDP	4787	7500	83773	91223	58723	1.80
Zinc levels						
Z_1: No zinc	4568	7525	79940	87465	58035	1.71
Z_2 :10 kg $ZnSO_4$/ha	4679	7382	81882	89264	59254	1.97
Z_3 : 20 kg $ZnSO_4$/ha	4779	7349	83632	90981	60391	1.97

• Cost of wheat seed Rs./kg. =	22.00	• Price of wheat grain Rs./kg =	17.50
• Fipronil @ 5% SC, 0.3 g a.i./seed 600 ml/100 kg seed)Rs. =	1050.00	• Price of wheat straw: Rs. /kg =	1.00
• Urea per kg Rs./kg =	6.40	• Price of DAP Rs. /kg =	24.00