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Effect of NPK levels along with city compost on growth, yield and economics of wheat (*Triticum aestivum* L.) under system of wheat intensification (SWI)

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Abstract
A field experiment was conducted on medium black calcareous soil at Junagadh (Gujarat) during *rabi* season of 2019-20 to study the effect of NPK levels along with city compost on growth, yield and economics of wheat (*Triticum aestivum* L.) under system of wheat intensification (SWI). Total twelve treatment combinations, consisting of three system of sowing (S_1: normal practice at 22.5 cm, S_2: SWI at 20 cm × 20 cm and S_3: SWI at 25 cm × 25 cm) were assigned to main plot and four fertility levels (F_1: city compost 10 t/ha, F_2: 50% RDF + city compost 5 t/ha, F_3: 75% RDF + city compost 5 t/ha and F_4: 100% RDF) were allotted to sub plots in a split plot design with three replications. The experimental results revealed that sowing of wheat under system of wheat intensification (SWI) at 25 cm × 25 cm and 20 cm × 20 cm recorded significantly higher values of plant height, dry matter accumulation/plant, root volume/plant, root dry weight/plant, length of spike, number of spikelets/spike, number of grains/spike, grain weight/spike and 1000-grain weight. Although SWI at 20 cm × 20 cm produced significantly maximum number of effective tillers/m^2 and ultimately gave higher grain yield and straw yield with higher net return and B:C ratio. Application of 75% RDF (90-45-45 kg N- P_2O_5- K_2O/ha) + city compost 5 t/ha enhanced almost all the growth parameters *viz.*, plant height, dry matter accumulation/plant, root volume/plant and root dry weight/plant, yield attributes *viz.*, number of total tillers/m row length, number of effective tillers/m row length, number of effective tillers/m^2, number of effective tillers/plant, length of spike, number of spikelets/spike, number of grains/spike, grain weight/spike and 1000-grain weight and resultantly gave higher grain yield and straw yield with higher net return. Maximum B:C ratio was achieved when wheat was fertilized with 100% RDF, followed by 75% RDF + city compost 5 t/ha.

Keywords: Wheat, NPK, city compost, system of wheat intensification (SWI), growth, yield

1. Introduction

Wheat (*Triticum aestivum* L.) is the world's most widely cultivated cereal food crop and having immense importance in Indian diet. Wheat compares well with other cereals in nutritive value with a good nutritional profile of 12.1% protein, 1.8% lipids, 1.8% ash, 2.0% reducing sugars, 6.7% pentose, 59.2% starch, 70% total carbohydrates and provides 314 K cal/100 g of food. It is also a good source of minerals and vitamins *viz*., calcium (37 mg/100 g), iron (4.1 mg/100 g), thiamine (0.45 mg/100 g), riboflavin (0.13 mg/100 g) and nicotinic acid (5.4 mg/100 g) (Lorenz and Kulp, 1991) [13]. The optimum temperature for wheat growth is 25 °C with minimum and maximum growth temperatures of 3 to 4 °C and 30 to 32 °C, respectively (Briggle, 1980) [5]. Intensive agriculture involves the dwarf varieties of wheat having great potential but due to exhaustive nature they require more nutrients and have posed a great threat to long-term sustainability of crop production. The farmers are using high analyzed inorganic fertilizers to get higher yield of wheat. Soils which receive plant nutrients only through chemical fertilizers are showing declining productivity despite being supplied with sufficient nutrients. Organic manures are a good source of nutrients and micronutrients, it contributes towards build-up of organic matter in soil. Nowadays, composted municipal solid waste (MSW) known as 'city compost' is being popular in agriculture as a soil conditioner and fertilizer. City compost is mostly used in agriculture to supply nitrogen and organic matter into the soil. Only 8% of waste is composted globally, and as low as 1.5% in low income countries (World Bank, 2016) [29]. The amount of waste is being increased day by day parallel to the increasing population in the world. The uncontrolled decomposition of organic solid waste can result in large-scale contamination of soil, water, and air (Ghosh *et al*., 1997) [7]. For a sustainable agriculture, it is imperative to utilize renewable inputs which can maximize the ecological benefits and minimize the environmental hazards.

To cope-up with the situation, the use of organic manures with fertilizers is receiving attention in intensive agriculture. One possible way of achieving this is to decrease dependence on use of chemical NPK fertilizers by the use of city compost made from town waste. System of wheat intensification (SWI) popularly known '*Sri Vidhi Gehun'* is a methodology for wheat cultivation. Its root goes in system of rice intensification (SRI) principle being practiced in paddy. SWI is an innovative concept for wheat cultivation. In this method wide row to row and plant to plant spacing (10 cm - 25 cm) is maintained. Spacing provides sufficient aeration, proper light, moisture and reduced competition for nutrient leading to better roots and shoot growth. The system of wheat intensification (SWI), based on low-tech methods, may be more labor-intensive than traditional techniques, but it requires less seeds, water, pesticide and fertilizer. Yield obtained in SWI is double than that of obtained conventional methods (Abraham *et al.,* 2014) [2]. Taking note of the facts highlighted above, a field experiment was conducted to study the effect of NPK levels along with city compost on growth, yield and economics of wheat (*Triticum aestivum* L.) under normal practice and system of wheat intensification (SWI).

2. Materials and Methods

A field experiment was conducted on a medium black calcareous soil at Instructional Farm, Department of Agronomy, College of Agriculture, Junagadh Agricultural University, Junagadh (Gujarat) in *rabi* season of 2019-20. The experimental soil was clayey in texture and slightly alkaline in reaction with $pH_{2.5}$ 8.0 and $EC_{2.5}$ 0.43 dS/m. The soil was low in organic carbon content (0.45%). The soil was low in available nitrogen (242 kg/ha) and medium in available phosphorus (33.15 kg/ha) and potassium (230 kg/ha).

Total twelve treatment combinations, consisting of three system of sowing [S_1: normal practice at 22.5 cm, S_2: SWI at 20 cm × 20 cm and S_3: SWI at 25 cm × 25 cm] were assigned to main plot and four fertility levels [F_1: city compost 10 t/ha, F_2: 50% RDF (60-30-30 kg N- P_2O_5- K_2O/ha) + city compost 5 t/ha, F_3: 75% RDF (90-45-45 kg N- P_2O_5- K_2O/ha) + city compost 5 t/ha and F_4: 100% RDF (120-60-60 kg N- P_2O_5- K_2O/ha)] were allotted to sub plots in a split plot design with three replications.

The wheat variety 'Gujarat Junagadh Wheat 463' (GJW 463) was sown on November 07, 2019 at the rate of 120 kg/ha at row spacing 22.5 cm in respect of normal sowing. However, under system of wheat intensification (SWI) two to three seeds per hill (20-25 kg/ha) were sown as per row-to-row and plant-to-plant spacing of the treatments.

SWI cultivation is a system rather than a technology in which different seed treatment techniques are adopted. For 10 kg seed treatment, 20 litres of water heated, up to 60 °C in an earthen vessel then seeds were poured in the hot water. Floating seeds were removed from the hot water, 2.25 kg vermicompost, 1100 g jaggery and 4 litre cow urine were added and kept for 8 hours. Separate seed mixture from the solution and treated with 2 g of Bavistin powder per kg seed. Treated seeds were kept in wet jute bag for 8-10 hours, which are then dried in shade for about an hour. Two seeds of wheat were dibbled in the field at a depth of 5 cm by maintaining different spacings *i.e.* 20 cm x 20 cm & 25 cm x 25 cm.

Nutrient application was done as per the treatment. KRIBHCO (Krishak Bharati Cooperative Limited) enriched city compost was used. The compost was already enriched with specific strains of N fixers, PSB and cellulolytic microorganisms. City compost was applied one day before sowing and incorporated into the top 20-25 cm soil manually. Nitrogen, phosphorus and potassium was applied through Urea (46% N), Single super phosphate (16% P_2O_5) and Muriate of potash (60% K_2O). 1/3 of nitrogen and full dose of phosphorus and potash is applied at sowing and rest 2/3 of nitrogen is applied in two equal spilts at 25 and 45 days after sowing. The crop was harvested at physiological maturity on March 06, 2020. Grain and straw yield were recorded from the net plot area and converted into kg per hectare base.

In order to evaluate the effectiveness of different treatments and ascertain the most remunerative treatment, total expenses for all the cultivation operations from preparatory tillage to harvesting including the cost of inputs *viz.,* seeds, fertilizers, city compost, herbicides, *etc*. applied to each treatment were calculated on the basis of prevailing local charges. The gross realization in terms of rupees per hectare was worked out taking into consideration the wheat grain and straw yields from each treatment and multiplying it with prevailing market prices. Net returns of each treatment were calculated by deducting the total cost of cultivation from the gross returns. The benefit: cost (B:C) ratio was calculated by dividing gross return with cost of cultivation.

3. Results and Discussion

3.1 Effect of system of sowing

3.1.1 Effect on growth parameters

Scrutiny of data presented in Table 1 indicated that different system of sowing showed their significant effect on plant height. Plant height at 30 DAS (33.87 cm), 60 DAS (67.45 cm) and at harvest (83.61 cm) recorded significantly higher when crop was sown under SWI at 25 cm × 25 cm, which was closely followed by SWI at 20 cm × 20 cm and the shorter plant was found under normal practice at 22.5 cm. This might be due to early germination of seeds in system of wheat intensification than conventional method. At later stages, wider plant spacing under SWI effectively modify the environmental conditions of plants by proper distribution of plants over ground area, root distribution and nutrient availability which resulted in increased interception, absorption and utilization of photosynthetically active radiation (PAR) thereby resulting in higher photosynthesis and finally plant height. These results are in conformity with those reported by Tripathi *et al.* (2001) [27], Haque *et al*. (2015) [9] and Singh *et al.* (2016) [23].

Significantly higher dry matter accumulation/plant, root volume/plant and root dry weight/plant at 30, 60 DAS and at harvest (Table 1) were recorded when crop was sown under SWI at 25 cm × 25 cm, which was remained at par with SWI at 20 cm × 20 cm. Whereas, the lowest values were found under normal practice at 22.5 cm. Wider spacing under SWI decreased competition between plants for light, water, space and nutrient due to higher light interception, root distribution and nutrient availability that play important role in plant growth which might be turned in better vegetative growth and produced more dry matter accumulation/plant, root volume/plant and root dry weight/plant. These results are in conformity with those reported by Gupta *et al.* (2006) [8], Hozayn *et al.* (2012) [10] and Mithilesh and Abraham (2017) [14].

3.1.2 Effect on yield attributes

The data presented in Table 2 revealed that different system of sowing does not exhibited their significant influence on number of total tillers and effective tillers/m row length at harvest. These results are in conformity with those reported by Kataria and Sharma (2006) [12]. Number of effective tillers/m^2 were significantly affected by different system of sowing. Data presented in Table 2 indicated that sowing of wheat under SWI at 20 cm × 20 cm produced significantly higher number of effective tillers/m^2 (272.50) at harvest, which was remained at par with normal practice at 22.5 cm. While, significantly the lowest number of effective tillers/m^2 (221.00) at harvest was recorded under SWI at 25 cm × 25 cm. Under SWI management practices planting in square method with wider spacing might have resulted in a greater number of effective tillers per hills. Wider spacing facilitate plants for better utilization of nutrient, water, light and space leading to produced maximum number of effective tillers per unit area than normal practice. Number of effective tillers/m^2 increased under SWI at 20 cm × 20 cm, however, effective tillers/m^2 reduced with increasing spacing under SWI at 25 cm × 25 cm. This was mainly due to the decrease in number of planting hills per unit area. These results are in accordance with the findings of Jat and Singhi (2004) [11], Pandey and Kumar (2005) [17], Pandey and Dwivedi (2007) [16] and Singh *et al.* (2018) [24]. Tillering ability is genetically controlled, but it is also much dependent on the environmental factors. SWI had higher number of tillers as under wider spacing each individual plant could have effectively utilized the more available resources such as space, foraging area for root system, better root spread, more light interception *etc*., which ultimately resulted in significantly higher number of effective tillers/plant (5.06) under SWI at 25 cm × 25 cm and it was found statistically at par with SWI at 20 cm × 20 cm. Whereas, significantly minimum number of effective tillers/plant (3.44) were recorded under normal practice at 22.5 cm. These results are in close agreement with those reported by Mithilesh and Abraham (2017) [14].

The data presented in Table 2 revealed that the yield attributes such as length of spike (10.77 cm), number of spikelets/spike (16.01), number of grains/spike (44.66), grain weight/spike (2.03 g) and 1000-grain weight (46.05 g) were significantly improved when it was sown under SWI at 25 cm × 25 cm, which was remained at par with SWI at 20 cm × 20 cm. Whereas, the lowest values were found under normal practice at 22.5 cm. Variations in the yield attributes of wheat were due to individual hills in SWI and it might be supported more favorable yield attributes than in closely-spaced plants under normal practice. The beneficial effect of line and cross sowing has been reported by several researchers in which cross sowing method was shown to be superior over all other methods of wheat planting. Similar results were reported by Jat and Singhi (2004) [11], Singh *et al.* (2016) [23], Singh *et al.* (2018) [24] and Saxena *et al.* (2019) [21].

3.1.3 Effect on yields and economics

The data presented in Table 3 revealed that grain yield and straw yield of wheat were significantly influenced by different system of sowing. Highest grain yield (5070 kg/ha) and straw yield (8289 kg/ha) were recorded under SWI at 20 cm × 20 cm as compared to SWI at 25 cm × 25 cm and normal practice at 22.5 cm. This was mainly due to the fact that wider spacing under SWI at 25 cm × 25 cm could not compensate the drastic decrease in plant population and effective tillers resulting in severe decrease in number of ear head per unit area. The higher yields under SWI was due to adequate supply of resources which contributed towards higher dry matter accumulation and better partitioning of photosynthates resulting in higher yield traits and ultimately the yield. This was in conformity with the finding of Kataria and Sharma (2006) [12], Suryawanshi *et al*. (2013) [26], Singh *et al.* (2016) [23] and Singh *et al.* (2018) [24]. Among different system of sowing, SWI at 20 cm × 20 cm recorded maximum gross return (₹ 119497/ha), net return (₹ 59720/ha) and B:C ratio (2.00). This might be due to improved yield attributing characters contributed towards significantly higher economic yield of wheat which obtained with comparatively lower expenditure than additional income under SWI at 20 cm × 20 cm.

3.2 Effect of fertility levels

3.2.1 Effect on growth parameters

Increasing fertility level increased the plant height (Table 1) and significantly maximum plant height at 30 DAS (33.97 cm), 60 DAS (66.80 cm) and at harvest (84.27 cm) were observed with the application of 75% RDF + city compost 5 t/ha, which were remained at par with 50% RDF + city compost 5 t/ha. This could be due to improved N, P and K supplying capacity of soil. The positive effect of fertility levels on plant height has been obtained because nitrogen is needed for the formation of chlorophyll, phosphorus for the synthesis of nucleic acids and similarly potassium is important for the growth and elongation probably due to its function as an osmoticum and may react synergistically with indole acetic acid (Cocucci and Dallarosa, 1980) [6] which is responsible for growth and development. These results are in accordance with the findings of Verma *et al*. (2006) [28], Singh *et al.* (2007) [25] and Aktar *et al.* (2018) [4].

Among the growth parameters studied, dry matter accumulation/plant, root volume/plant and root dry weight/plant at 30, 60 DAS and at harvest (Table 1) were significantly improved under the application of 75% RDF + city compost 5 t/ha. The reason behind this might be adequate availability of applied or native soil nutrients, due to the solubilizing effect of organic acids produced during the decomposition of city compost and effective translocation of photosynthates from source to sink. These results corroborate the findings of Nehra *et al.* (2001) [15], Mithilesh and Abraham (2017) [14], Sahu *et al.* (2017) [19] and Aktar *et al.* (2018) [4].

3.2.2 Effect on yield attributes

The data furnished in Table 2 indicated that number of total tillers/m row length (90.95), number of effective tillers/m row length (66.56), number of effective tillers/m^2 (298.26) and number of effective tillers/plant (4.99) at harvest were significantly improved under the application of 75% RDF + city compost 5 t/ha. This improvement in number of tillers is due to more availability of plant nutrients (NPK) in soil. This could have been due to the increased efficiency of applied chemical fertilizers by city compost. This boosted vegetative growth under the application of 75% RDF + city compost 5 t/ha was due to increased multi-nutrients which promoted plant growth by ensuring higher number of green leaves with increased photosynthesis as a result of increased metabolism of the absorbed plant nutrients, forming longer and stronger roots to absorb sufficient water and nutrients. Data presented in Table 2 showed that application of 75% RDF + city compost 5 t/ha to wheat recorded significantly maximum values of length of spike (11.12 cm), spikelets/spike (16.52), grains/spike (46.78), grain weight/spike (2.07 g) and 1000-

grain weight (46.06 g) at harvest. The higher yield attributes from this fertility level may be due to increased growth parameters as a result of increased supply of all the essential plant nutrients as well as increased physico-chemical and biological properties of the soil. The favorable conditions for the formation of higher number of effective tillers also resulted in production of higher number of spikes. Due to more photosynthetic ability and production of higher dry matter provide sufficient nutrient to sink continually making the seed more plump, increased 1000-grain weight, grains/spike and grain weight/spike. These results are in accordance with the findings of Akhtar *et al*. (2007) [3], Sarwar *et al*. (2007) [20], Abedi *et al.* (2010) [1] and Aktar *et al.* (2018) [4].

3.2.3 Effect on yields and economics

The data furnished in Table 3 indicated that grain yield and straw yield of wheat were significantly influenced by different levels of NPK & city compost. Application of 75% RDF + city compost 5 t/ha to wheat produced significantly higher grain yield (5975 kg/ha) and straw yield (8344 kg/ha). Whereas, for straw yield, treatments 75% RDF + city compost 5 t/ha and 50% RDF + city compost 5 t/ha were found statistically at par. Integrated use of chemical fertilizers with city compost supplied nutrients in balanced quantity throughout the various growth stages might have enabled the plants to assimilate sufficient photosynthetic product and thus increased the yield. The results obtained in present study are in close agreement with those reported by Ram *et al*. (2005) [18], Akhtar *et al.* (2007) [3], Sarwar *et al.* (2007) [20], Sefidkoohi *et al.* (2012) [22] and Aktar *et al.* (2018) [4]. Data further showed that wheat fertilized with 75% RDF + city compost 5 t/ha recorded maximum gross return (₹ 140104/ha) and net return (₹ 78773/ha). This might be due to sufficient availability and more uptake of nutrients by crop ultimately resulted in better plant growth that leads to higher economic yield and hence higher gross and net return. The maximum B:C ratio was obtained when wheat was fertilized with 100% RDF (2.88), while further increase in fertility levels with 75% RDF + city compost 5 t/ha obtained less B:C ratio (2.28). The law of diminishing return was very much relevant to witness the cause of decreased B:C ratio beyond 100% RDF.

3.3 Interaction effect

The interaction effect between levels of NPK & city compost and system of sowing was found non-significant for all the parameters studied.

Table 1: Effect of different system of sowing and fertility levels on growth parameters of wheat

Treatments	Plant height (cm) at			Dry matter accumulation/plant (g) at			Root volume/plant (ml) at			Root dry weight/plant (g) at		
	30 DAS	60 DAS	Harvest	30 DAS	60 DAS	Harvest	30 DAS	60 DAS	Harvest	30 DAS	60 DAS	Harvest
System of sowing- (S)												
S_1- Normal practice at 22.5 cm	27.54	56.00	74.54	0.76	5.93	8.18	0.49	0.88	1.28	0.11	0.76	1.28
S_2- SWI at 20 cm × 20 cm	33.46	65.52	82.69	0.86	8.99	14.89	0.59	1.55	2.21	0.15	1.18	1.97
S_3- SWI at 25 cm × 25 cm	33.87	67.45	83.61	0.93	9.52	16.34	0.66	1.63	2.33	0.16	1.29	2.12
S.Em.±	1.24	2.20	1.89	0.03	0.26	0.38	0.02	0.04	0.05	0.01	0.04	0.07
C.D. at 5%	4.87	8.63	7.43	0.10	1.04	1.50	0.09	0.16	0.21	0.02	0.15	0.26
C.V.%	13.58	12.08	8.17	10.31	11.24	10.09	13.48	10.19	9.61	10.66	12.15	12.66
NPK & city compost- (F)												
F_1- City compost 10 t/ha	28.22	58.43	74.62	0.75	7.17	10.36	0.45	1.15	1.49	0.12	0.86	1.47
F_2- 50% RDF + City compost 5 t/ha	32.94	64.76	82.62	0.87	8.33	13.68	0.64	1.41	2.08	0.15	1.15	1.86
F_3- 75% RDF + City compost 5 t/ha	33.97	66.80	84.27	0.94	9.05	15.69	0.69	1.51	2.20	0.16	1.24	2.02
F_4- 100% RDF	31.35	61.96	79.61	0.86	8.05	12.82	0.54	1.33	1.99	0.14	1.06	1.81
S.Em.±	0.84	1.54	1.56	0.02	0.20	0.35	0.01	0.03	0.04	0.01	0.03	0.05
C.D. at 5%	2.51	4.58	4.62	0.06	0.58	1.04	0.03	0.09	0.11	0.01	0.08	0.16
C.V.%	8.01	7.34	5.81	6.84	7.18	8.00	5.50	6.45	5.84	7.45	7.25	8.92
Interaction (S X F)												
S.Em.±	1.46	2.67	2.69	0.03	0.34	0.61	0.02	0.05	0.07	0.01	0.05	0.09
C.D. at 5%	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Table 2: Effect of different system of sowing and fertility levels on yield attributes of wheat

Treatments	Number of tillers (at harvest)				Length of spike (cm)	Number of spikelets/spike	Number of grains/spike	Grain weight/spike (g)	1000-grain weight (g)
	No. of total tillers per m row length	No. of effective tillers per m row length	No. of effective tillers/m^2	No. of effective tillers/plant					
System of sowing- (S)									
S_1- Normal practice at 22.5 cm	74.92	58.67	260.48	3.44	8.60	12.97	37.33	1.45	40.05
S_2- SWI at 20 cm × 20 cm	82.33	54.50	272.50	4.61	9.81	14.47	41.55	1.85	44.81
S_3- SWI at 25 cm × 25 cm	73.33	56.08	221.00	5.06	10.77	16.01	44.66	2.03	46.05
S.Em.±	2.88	2.32	10.12	0.12	0.28	0.53	1.13	0.05	0.95
C.D. at 5%	NS	NS	39.73	0.47	1.09	2.09	4.45	0.21	3.74
C.V.%	13.00	14.23	13.95	9.46	9.87	12.74	9.54	10.33	7.57
NPK & city compost- (F)									
F_1- City compost 10 t/ha	58.28	43.89	196.20	3.69	7.76	11.52	32.17	1.30	40.88
F_2- 50% RDF + City compost 5 t/ha	81.39	59.78	267.83	4.56	10.36	15.36	43.93	1.91	43.97
F_3- 75% RDF + City compost 5 t/ha	90.95	66.56	298.26	4.99	11.12	16.52	46.78	2.07	46.06
F_4- 100% RDF	76.83	55.44	243.01	4.24	9.66	14.52	41.84	1.83	43.63
S.Em.±	2.74	2.06	9.08	0.09	0.21	0.38	0.94	0.05	0.68
C.D. at 5%	8.15	6.13	26.97	0.27	0.63	1.12	2.80	0.15	2.03

C.V.%	10.70	10.98	10.83	6.29	6.59	7.81	6.86	8.54	4.71
Interaction (S X F)									
S.Em.±	4.75	3.58	15.72	0.16	0.37	0.65	1.63	0.09	1.19
C.D. at 5%	NS	NS	NS	NS	NS	NS	NS	NS	NS

Table 3: Effect of different system of sowing and fertility levels on yields and economics of wheat

Treatments	Grain yield (kg/ha)	Straw yield (kg/ha)	Cost of cultivation (₹/ha)	Gross return (₹/ha)	Net return (₹/ha)	B:C ratio
System of sowing- (S)						
S_1- Normal practice at 22.5 cm	3870	6815	61763	91441	29678	1.48
S_2- SWI at 20 cm × 20 cm	5070	8289	59777	119497	59720	2.00
S_3- SWI at 25 cm × 25 cm	4537	7434	59348	106924	47576	1.80
S.Em.±	135	204	-	-	-	-
C.D. at 5%	529	801	-	-	-	-
C.V.%	10.39	9.40	-	-	-	-
NPK & city compost- (F)						
F_1- City compost 10 t/ha	2574	5857	84024	61487	-22537	0.73
F_2- 50% RDF + City compost 5 t/ha	5050	8174	59951	118968	59017	1.98
F_3- 75% RDF + City compost 5 t/ha	5975	8344	61331	140104	78773	2.28
F_4- 100% RDF	4370	7677	35879	103257	67378	2.88
S.Em.±	124	158	-	-	-	-
C.D. at 5%	370	470	-	-	-	-
C.V.%	8.31	6.32	-	-	-	-
Interaction (S X F)						
S.Em.±	215	274	-	-	-	-
C.D. at 5%	NS	NS	-	-	-	-

4. Conclusion

On the basis of the results obtained from the present one year field experimentation, it could be concluded that higher production and net realization of wheat can be obtained by the application of 75% RDF (90-45-45 kg N- P_2O_5- K_2O/ha) + city compost 5 t/ha under system of wheat intensification (SWI) at 20 cm × 20 cm on medium black calcareous soil.

5. Acknowledgments

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