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Grain yield and correlation with weather factors as influenced by application of various organic nutrient sources under Akola Condition

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Abstract
A field investigation was conducted at agronomy farm, Dr. P.D.K.V, Akola during *rabi* season of 2016. soil of experimental plot was clayey in texture, medium in organic carbon, moderate in available nitrogen, medium in available phosphorus and high in potassium. The wheat crop was sown on 22nd November 2016 and harvested in 13th March, 2017. Overall the weather during growing season was favourable. Experiment was laid out in Randomised Block Design (RBD) with ten (10) treatments replicated thrice. The gross and net plot sizes were 5.4 m x 7.0 m and 4.68 m x 6.16 m, respectively. Treatments include control (T_1), Compost @ 8.5 t ha^{-1} (T_2), Soil application of Azotobacter and PSB @ 10.0 kg ha^{-1} (T_3), Liquid Organic NPK three foliar sprays (T_4), Liquid Organic K foliar spray (T_5), Compost + Soil application of Azotobacter and PSB + Three foliar sprays of liquid organic NPK(T_6), compost + Three foliar sprays of liquid organic NPK + One foliar spray of liquid organic potash (T_7), Soil application of Azotobacter and PSB + Three foliar sprays of liquid organic NPK + One foliar spray of liquid organic potash (T_8), Compost + Soil application of Azotobacter and PSB + Three foliar sprays of liquid organic NPK + One foliar spray of liquid organic potash(T_9), Compost + Soil application of Azotobacter and PSB (T_{10}).
Result indicated that grain and straw yield was significantly influenced by treatments applied with compost + soil application of Azotobacter and PSB + 3 foliar sprays of liquid organic NPK + one foliar spray of liquid organic potash. correlation indicated that tmax i.e. maximum temperature showed significant and positive corelationship with grain yield similarly, wind speed during the crop growing period also showed positive and significant correlation with grain yield other weather fators didnot show any association ship with grain yield. Whereas, straw yield did not show any significant association ship during the experimentation.

Keywords: organic fertilizers, wheat correlation, weather factors

Introduction
Wheat (*Triticumaestivum*) is an annual plant of gramineafamily. It is most widely cultivated as staple food crop of the world. The outstanding and unique historical feature of wheat cultivation is the prominence of this staple food plant in humanity's progressive domination as a colonizer of Worlds land surface. It is cultivated extensively in north western and central zone. North West India along with Afghanistan probably forms the center of origin of bread wheat and India is one of the ancestral land of this essential food crop. More land is devoted worldwide to the production of wheat than any other crop. USA, Russia, China, Australia, Germany, France, Argentina and India are the main wheat producing countries required in order to survive.
The main species of wheat are Common wheat (*Triticumaestivum*.), Durum wheat (*Triticum durum*) and Emmer wheat (*Triticumdicoccum)*. It is grown across the wide range of environments around the world has the highest adaptation among all the crop species. Worldwide more land is devoted to the production of wheat than any other crop. In India more than 80 percent of the total area of Wheat is under *Triticumaestivum*. Whereas the area under (*Triticum durum)* and *Triticumdicoccum*is only 10 percent and 1 percent, respectively. In India wheat is second important food crop next to rice. It was the crop that brought in the green revolution and paved the way for the food security in India. It contributes about 25 percent of the total food grain production of the India. Wheat is grown all over the India, from sea level up to elevation of 3568 meters in the Himalaya (Rao *et al*. 1992).

Material and Methods

A field investigation was conducted at agronomy farm, Dr. P.D.K.V, Akola (MS) 444104, During *rabi* season of 2016. The soil of experimental plot was clayey in texture, medium in organic carbon, moderate in available nitrogen, medium in available phosphorus and high in potassium. The wheat crop was sown on 22nd November 2016 and harvested on 13th Mar, 2017. Overall the weather during growing season was faverable for Wheat crop. Experiment was laid out in Randomised Block Design (RBD) with ten (10) treatments replicated thrice. The gross and net plot sizes were 5.4 m x 7.0 m and 4.68 m x 6.16 m, respectively. Treatments include control (T_1), Compost @ 8.5 t ha^{-1} (T_2), Soil application of Azotobacter and PSB @ 10.0 kg ha^{-1} (T_3), Liquid Organic NPK three foliar sprays (T_4), Liquid Organic K foliar spray (T_5), Compost + Soil application of Azotobacter and PSB + Three foliar sprays of liquid organic NPK(T_6), compost + Three foliar sprays of liquid organic NPK + One foliar spray of liquid organic potash (T_7), Soil application of Azotobacter and PSB + Three foliar sprays of liquid organic NPK + One foliar spray of liquid organic potash (T_8), Compost + Soil application of Azotobacter and PSB + Three foliar sprays of liquid organic NPK + One foliar spray of liquid organic potash(T_9), Compost + Soil application of Azotobacter and PSB (T_{10}). All required cultural practices were adopted to grow the crop. Data on grain and straw yield was collected and presented in Table 1. And simple correlation worked out from the data are presented in Table 2.

Results

Grain yield and straw yield (kg ha^{-1})

Data regarding grain yield kg ha^{-1} as influenced by various treatments are presented in Table 1. Grain and straw yield differences recorded by various organic nutrient sources were found significant.

Table 1: Grain yield and straw yield (kg ha^{-1}) of wheat as influenced by various treatments

Treatments		Grain yield (kg ha^{-1})	Straw yield (kg ha^{-1})	Harvest Index (%)
T_1	Control	1571	2266	40.05
T_2	Compost @ 8.5 t ha^{-1}	3636	5012	41.07
T_3	Soil application of Azotobacter and PSB @ 10.0 kg ha^{-1}	1780	2573	40.28
T_4	Liquid Organic NPK 3 foliar sprays	1864	2785	40.31
T_5	Liquid Organic Potash one foliar spray	1642	2423	40.18
T_6	$T_2 + T_3 + T_4$	4129	5759	42.07
T_7	$T_2 + T_4 + T_5$	3840	5487	41.15
T_8	$T_3 + T_4 + T_5$	1995	2989	40.95
T_9	$T_2 + T_3 + T_4 + T_5$	4275	5693	42.87
T_{10}	$T_2 + T_3$	3941	5679	41.75
SE (m) ±		195	212	1.68
CD P=0.05		577	631	NS
CV (%)		11.74	9.04	7.09

Wheat grain yield (4275 kg ha^{-1}) and straw yield (5693 kg ha^{-1}) was significantly higher with application of compost + soil application of Azotobacter and PSB + Three foliar sprays of liquid organic NPK + one foliar spray of liquid organic potash over most of the treatments and being at par with application of compost + soil application of Azotobacter and PSB + Three foliar sprays of liquid organic NPK, compost + soil application of Azotobacter and PSB and Compost + Three foliar sprays of liquid organic NPK + One foliar spray of liquid organic potash. All treatments were yielded highly significant over control. The lowest grain yield (1571 kg ha^{-1}) and straw yield (2266 kg ha^{-1}) was recorded with control.These results are in agreement with the finding of Agarwal *et al.* (2003) [1], Desai *et al.* (2000) [2], Deshmukh *et al*. (1995) [3] and Singh and Agarwal (2001) [5].

Harvest Index

Harvest index (Table 1) calculated from the available data indicated that higher values of harvest index were registered with application of compost + soil application of Azotobacter and PSB + Three foliar sprays of liquid organic NPK + One foliar spray of liquid organic potash (42.87 %), followed by compost + soil application of Azotobacter and PSB + Three foliar spray of liquid organic NPK (42.07 %) and compost + soil application of Azotobacter and PSB (41.75)

Correlation

correlation of grain and straw yield of Wheat with differentweather parameters indicated that t max i.e. maximum temperature showed significant and positive relationship with grain yieldit might be due to favourable temperatureduring the growth stage of crop, similarfindings are also reprted bu peran venkatrao, 2016, similarly, wind speed during the crop growing period also showed positive and significant correlation with grain yield other weather fators did not show any association ship with grain yield. Whereas, straw yield did not show any significant associationship during the experimentation.

Table 1: Simple correlation of grain and straw yield with different weather parameters during crop growth of Wheat crop during crop growth period

grain yield		T MAX	T MIN	BSH	wind speed	rel humidity morning	Relative Humidity afternoon	Open pan evaporation	rainfall	Cumulative rainfall
	Table r	0.088	0.13	-0.15	0.448	-0.22	-0.28	0.26	0.26	0.39
5%	0.444	SIG	NS	NS	SIG	NS	NS	NS	NS	NS
1%	0.561	SIG	NS	NS	NS	NS	NS	NS	NS	NS
straw yield		T MAX	T MIN	BSH	wind speed	rel humidity morning	Relative Humidity afternoon	open pan evaporation	rainfall	Cumulative rainfall
	Table r	0.127	0.13	-0.15	0.4488	-0.22	-0.28	0.26	0.26	0.39
5%	0.444	NS	NS	NS	SIG	NS	NS	NS	NS	NS
1%	0.561	NS	NS	NS	NS	NS	NS	NS	NS	NS

Table 2: Days required to complete different phenophasesof *rabi* Wheat as Influenced by different Organic treatments

Treatments	Sowing to Emergence	Sowing to Crown Root Initiation	Sowing to tillering	Sowing to late jointing	Sowing to Panical Initiation	Sowing to 50% flowering	Sowing to Dough stage	Sowing to Physiological Maturity	Sowing to harvest
T_1	4.33	20.67	30.73	41.13	50.60	62.20	88.20	100.13	112.00
T_2	3.67	18.67	30.33	39.40	49.13	61.33	85.80	98.53	111.00
T_3	4.33	20.00	30.40	40.73	49.93	49.93	86.60	99.60	111.67
T_4	3.67	20.00	30.47	40.27	49.67	61.93	86.47	99.40	111.33
T_5	4.00	20.33	30.73	40.93	50.20	50.20	87.60	99.93	112.00
T_6	3.67	17.67	29.07	38.27	48.73	60.47	84.33	97.47	109.67
T_7	4.00	18.67	29.27	39.20	49.07	60.87	85.40	98.20	110.00
T_8	3.67	19.33	30.33	40.20	49.60	61.40	86.13	98.80	111.33
T_9	3.67	17.00	28.40	37.20	48.27	59.67	84.00	96.87	109.40
T_{10}	4.00	18.33	29.07	38.27	48.87	60.67	84.87	97.60	109.93
S E (m)±	0.34	0.55	0.43	0.35	0.15	0.24	0.18	0.15	0.41
C D p=0.05	1.03	1.65	1.31	1.05	0.46	0.72	0.56	0.47	1.23

Table 3: Cumulative growing degree days (^{0}C day$^{-1.}$) of *rabi*wheat as influenced by various organic treatments.

Growing Degree Days (GDD)									
Treatments	sowing to Emergence	Sowing to crown root initiation	Sowing to Tillering	Sowing to late jointing	Sowing to Panical initiation	Sowing to 50% flowering	Sowing to dough stage	Sowing to physiological maturity	Sowing to harvest
T_1	31.10	254.70	440.70	634.83	777.20	961.57	1412.03	1649.17	1908.40
T_2	31.17	216.00	440.70	617.50	760.30	932.47	1365.50	1615.50	1890.97
T_3	31.10	241.30	440.70	631.10	771.57	943.70	1385.50	1635.50	1902.87
T_4	31.17	241.60	440.70	624.30	760.30	943.70	1379.10	1635.50	1896.50
T_5	31.00	248.00	441.20	636.50	769.83	949.70	1398.30	1642.33	1908.40
T_6	31.43	196.73	423.00	591.40	745.60	921.23	1333.20	1596.20	1865.53
T_7	31.00	216.00	423.00	610.70	760.30	921.23	1358.70	1615.50	1871.90
T_8	31.17	228.50	441.73	631.10	760.30	937.70	1372.30	1622.17	1897.33
T9	31.17	184.00	405.20	573.40	745.60	900.00	1333.20	1590.27	1851.20
T_{10}	31.00	209.67	423.00	591.40	750.50	921.23	1345.77	1596.20	1865.53
S E (m)±	0.11	10.71	7.88	5.86	3.92	5.74	5.74	4.20	7.48
C D p=0.05	NS	31.84	23.43	17.43	11.67	17.06	16.15	12.50	22.24

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