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To study the improvement of growth and yield in Triticum (Wheat)

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Abstract

During the Present study it was tried to minimize the incidence of disease and improve the quality and quantity of crop plants by applying different methods. The complex environmental relation of the rust and their rapid dissemination and the rate of evolution of new physiological raises make the management of rust disease is very difficult task for the grower. In the present investigation it was observed that reduction in the nitrogen from NPK and the application of triazole and vitavax by seed treatment and foliar spray is very much effective to reduce the incidence of rust disease and to improve the yield and quality of Wheat. During this investigation eradication of stray was also observed.

The present study explores the information to minimise the disease incidence and improve the yield and quality of the Wheat crops by applying different methods such as dates of sowing irrigation and mulching etc.

Key words: Wheat, dates of sowing, growth, irrigation, yield, fertilizer.

Introduction

Wheat is an important principle cereal crop of temperate region. And very important in the human nutrition and is thus cultivated over a large area in the world. It belongs to the family Gramineae (Poaceae) and genus Triticum. Wheat crop season extends from late October to April in northern India. Out of total area under wheat cultivation 94.0 per cent area is under assured irrigation in more than 200 districts in India. It is an important cereal crop of India, ranking second after rice in area and production. India is Forth largest producer of wheat after China with about 12 per cent share in global food production. In India, area under wheat was 32.40 million hectares with a production of 95.20 million tonnes and productivity of 2.93 tonnes/ha during 2016-17 (Anonymous, 2017). It is grown in 219 million ha in the world (constituting about 32 per cent of total cereal cultivated lands worldwide) and comes at the first place among the cereals (FAO, 2015). Area under wheat in Punjab was 35.08 lac hectares with a production of 160.77 lac tonnes and productivity of 4.58 tonnes/ha during 2015-16 (Anonymous, 2016.Large climatic variations are being observed during the recent years leading to significant fluctuations in wheat productivity under Punjab conditions.

Thus, there is a great need to adopt such farm management strategies like appropriate date of sowing, irrigation scheduling and mulch application, etc. which can enable the crop to adopt to the climatic variations and thus sustain its productivity in the region. Numerous studies (Owiss et al., 1999; Bassu et al.,2009; Bannayan et al.2013) have reported increase in yield with early sowing and reduction when sowing is delayed after the optimum time. These authors reported that the cultivars that avoid frost risk at anthesis or the regions or seasons with low frost risk have an advantage of early sowing dates which produce high above ground biomass at flowering to maximize radiation interception. Mulumba and Lal (2008)

reported that mulching has potential to increase the soil quality as well as crop yields and increase the soil water storage especially in arid regions (Zhang et al., 2009). Zhang et al.(2005) showed that optimum yield of winter wheat can be obtained by application of irrigation once (at stem-extension) in wet seasons, twice (pre-winter and stem-extension stage) in normal seasons, and thrice (pre-winter, stem-extension and flowering stage) in dry seasons (each 80 mm). The wheat yields are significantly decreased when water deficits were applied in the stem elongation and heading stages (Tari et al.2016). In view of the impending climatic and water stress in the region, the present study was planned to evaluate the growth and yield of wheat under different dates of sowing, irrigation levels and mulch treatments.

MATERIALS AND METHODS

The field experiment was carried out at the Phulsanghavi Tq.Sirur and District Beed.Beed is one of the district of Maharashtra state located 640 meter high from the sea level lies between 76.7 east latitude 74 North latitude total 10922 square kilometre area and has 11 town and 1100 villages.The average yearly Temperature of the city is in the range between 26 ^{o}C to 28 ^{o}C. humidity ranges from 55 to 65 percent and the average rainfall is 540 mm to 600 mm.

The wheat variety Shiur - 496 was sown during two consecutive *rabbi* seasons of 2016-17 and 2017-18 using the seed @ 40 kg/acre. Thefield experiment comprising of 12 treatments was carried outin split plot design with four replications having three datesof sowing (D1- fourth week of October i.e. 30 October 2016, D2- second week of November i.e.15 November 2016 and D3- fourth week of November i.e. 30 November 2016) in main plots and two irrigation treatments, 5-6 weeks after first irrigation, 3-4/5-6 weeks after 2nd irrigation, 2/4 weeks after 3rd irrigation as per date ofsowing)) as well as two mulch treatments M1(without mulch)and M2 (with rice straw mulch @ 5 t/ha) in sub plots.Periodic tiller number, plant height and dry matter weremeasured at 15 days interval. The straw, grain yield as wellas yield attributing characters viz. ear length, effective tillercount, 1000 grain weight and number of grains per ear wererecorded at the time of threshing. Straw and grain yield from each plot was recorded from the net plot area (12 m^2)at the time of threshing and straw yield was worked out bysubtracting grain yield from the total weight of harvestedmaterial.

RESULTS AND DISCUSSION

During 2016-17, the crops sown on all three dates were atpar with respect to tiller number up to 60 DAS and after that Plant height **.**The plant height was at par in all the dates of sowing at 45 days after sowing and after that, D1 produced more plant height than D2 and D3 (Table 2). At harvest, plant height in D1 (80.50 and 85.60 cm) was significantly higher than D3 (72.80and 75.30 cm) but was at par with D2 (81.90 and 86.60 cm) during both the seasons. Gupta *et al.* (2007) and Smith, S.E. (2010) also reported decrease in plant height of wheat with delayed sowing. Plant height was significantly higher in case of I2 as compared to I1 after 60 days of sowing and at harvest, plant height in I1 was 79.8 cm and 85.6 cm and in I2 were 80.9 cm and 86.9 cm in both the years, respectively. The effect of mulch was non-significant on the plant height notwithstanding the fact that plant height was generally higher in case of mulch applied plots.

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Table 1. Periodic number of tillers per m-2 of wheat under different dates of sowing, irrigation and mulch levels during *rabi*2016-17 and 2017-18

Treatment	Tiller count per m2						
Sowing date	45 DAS 2016-2017-17 18	60DAS 2016-2017-17 18	75 DAS 2016-2017-17 18	90 DAS 2016-2017-17 18	105 DAS 2016-2017-17 18	120 DAS 2016-2017-17 18	At Harvest 2016-2017-17 18
30 October	508.75 486.1	540.9 545.7	420.9 530.6	546.9 612.3	470.8 584.3	446.3 530.2	412.7 512.9
15 November	500.05 413.4	532.7 539.2	529.7 596.2	444.3 556.2	402.4 510.3	382.3 508.0	371.9 456.1
30 November	510.1 404.4	502.00 478.3	519.4 539.1	426.0 512.0	352.1 480.6	330.8 467.1	330.0 447.5
Without Mulch	509.0 448.2	526.7 514.0	513.8 573.2	428.3 524.3	369.2 509.6	325.6 426.8	351.8 449.2
With straw mulch	492.26 473.0	525.5 534.7	515.6 563.2	422.4 524.1	392.70 510.7	371.7 510.3	349.2 425.1

Table 2. Periodic plant height (cm) of wheat under different dates of sowing, irrigation and mulch levels during *rabi* 2016-17 and 2017-18

Treatment	Periodic plant Height (cm)						
Sowing date	45 DAS 2016-2017-17 18	60DAS 2016-2017-17 18	75 DAS 2016-2017-17 18	90 DAS 2016-2017-17 18	105 DAS 2016-2017-17 18	120 DAS 2016-2017-17 18	At Harvest 2016-2017-17 18
30 October	30.5 35.1	50.7 44.8	71.0. 64.2	74.1 66.3	71.2 74.4	73.00 87.3	80.5 85.6
15 November	31.5 37.0	43.3 43.7	62.0 59.5	68.0 63.5	76. 0 79.0	81.0 84.8	81.9 86.6
30 November	31.0 35.6	37.7 39.8	53.0 54.0	60.0 60.0	74.0 7 2.7	74.0 7 2.7	72.8 75.3
Without Mulch (M1)	31.0 36.5	44.0 42.9	62.1 59.1	69.3 62.7	74.5 78.5	78.9 82.7	79.8 85.6
With straw mulch @ 5t/ha (M2) 31.7	31.7 37.4	44.8 43.6	63.1 60.7	70.5 65.2	76.1 80.2	80.4 84.5	80.9 86.9

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Table 3. Periodic dry matter accumulation (g/m2) in wheat under different dates of sowing, irrigation and mulch levels during *rabi* 2016-17 and 2017-18

Treatment	Periodic dry matter accumulation (g/m2)						
Sowing date	45 DAS 2016-17 2017-18	60DAS 2016-17 2017-18	75 DAS 2016-17 2017-18	90 DAS 2016-17 2017-18	105 DAS 2016-17 2017-18	120 DAS 2016-17 2017-18	At Harvest 2016-17 2017-18
30 October	301.7 340.7	483.2 574.0	628.5 837.3	827.0 1131.5	1235.3 1484.0	1562.8 1786.6	1674.8 1889.8
15 November	222.8 299.8	450.0 549.8	546.1 767.0	747.8 1079.0	1094.7 1345.3	1449.6 1674.6	1538.8 1753.8
30 November	200.1 252.4	401.4 487.5	501.2 703.6	697.0 1009.2	1018.2 1268.4	1365.5 1485.1	1395.5 1603.2
Without Mulch	240.9 298.2	4456 539.6	552.5 776.4	776.0 1079.2	752.6 1067.7	1100.6 350.0	1509.7 1726.4
With straw mulch @ 5t/ha (M2)	246.9 303.2	450.6 547.6	564.5 776.4	762.0 1079.2	1131.6 381.7	1485.6 1674.0	1563.7 1776.4

Table 4. Yield attributing characters of wheat under different dates of sowing, irrigation and mulch levels during *rabi* 2016-17and 2017-18

Treatment	**Grain yield (q/Ha)**		**straw yield (q/Ha)**		**Harvested index**	
Sowing date	2016-17	2017-18	2016-17	2017-18	2016-17	2017-18
30 October	43.40	45.50	78.40 86.40		0.55	0.52
15 November	41.00	40.50	76.40 82.40		0.53	0.48
30 November	37.50	38.20	74.00 76.40		0.50	0.50
Without Mulch	40.00	37.50	76.40 82.40		0.52	0.45
With straw mulch @ 5t/ha (M2)	45.00	43.50	79.40 82.40		0.56	0.52

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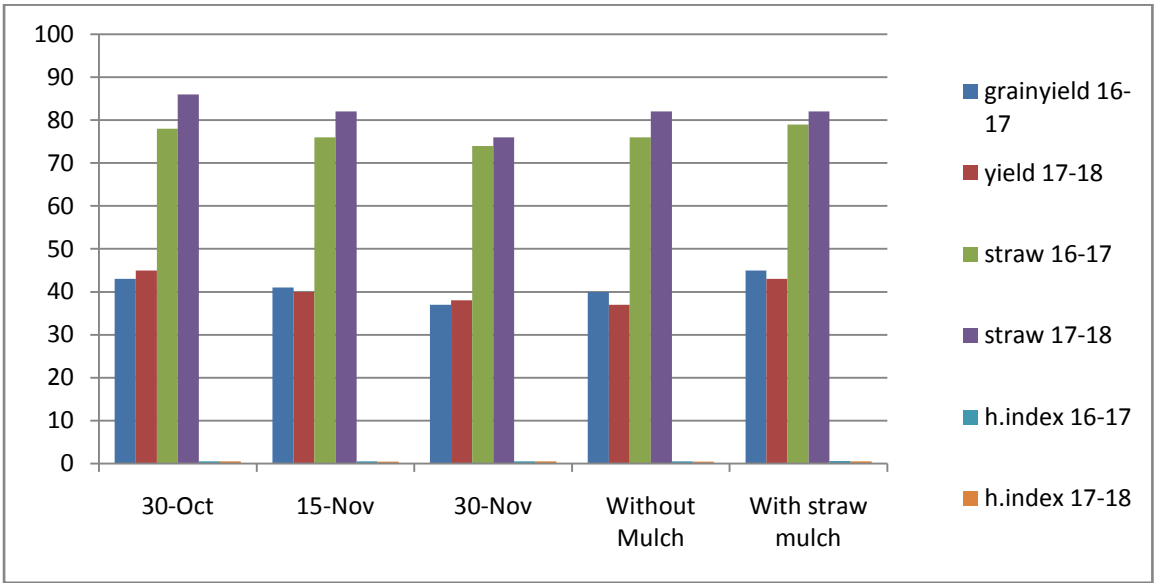

Dry matter production

Earlier sown crop produced significantly higher drymatter as compared to D2 and D3 (Table 3). At harvesting,total dry matter was 1674.80 g/m2 and 1889.80 g/m2 in D1,1538.80g/m2 and 1753.80g/m2 in D2 and 1395.56 g/m2 and1603.20 g/m2 in D3 in both the years , respectively. Gupta*et al.* (2010) and Mukherjee (2012) also reported that withdelayed sowing the accumulation of dry matter decreases inwheat crop. Among the irrigation regimes, total dry matter was significantly higher in I2 (1509.70 g/m2 and 1726.40 g/m2) as compared to I1 (1563.70 g/m2 and 11776.40 g/m2) in both the years. Total dry matter of 1563.70 g/m2 and 1776.40g/m2 was accumulated in mulched treatments as compared to 1509.70 g/m2 and 1726.540 g/m2 in case of non-mulch inboth the years, respectively. Singh *et al.* (2011) also reported that the retention of rice residue as a surface mulch could be beneficial for increasing soil water status and moderating soiltemperature thereby increasing root growth, plant canopyand dry matter.

Yield attributing characters

During 2016-17, significantly higher number of effective tillers were produced in D1 (412.70) as compared to D3(330.00) but were at par with D2 (371.9) (Table 1). The decrease in numbers of effective tillers with delayed sowingwas also reported by Nkema, I. (2007**.** The number ofeffective tillers was significantly higher in case of I2 (351.80) Irrigation level as compared to I1 (349.20). Pal *et al.* (2000)also reported an increase in the productive tillers (15–20%)with higher number of irrigations. Similar results were produced for the crop season of 2016-17.

Yield and harvest index

During both the years, D1 (43.40 q/ha and 45..50 q/ha) produced significantly higher grain yield as compared to D3 (37.50 q/ha and 38.20 q/ha) and was at par with D2 (41.00q/ha and 40.50 q/ha). Meena *et al.* (2015) also reported significantly highest grain yield in 1 November sown cropand it was at par with 16 November sown crop. Significantlyhigher grain yield was obtained in I2 (47.33 q/ha and 47.66 q/ha) as compared to I1 (43.72 q/ha 44.71 q/ha). The differencein grain yield due to mulch treatments was statistically non significant in both the years. Significantly higher straw yieldwas produced in D1 (45.00 q/ha and 43.50 q/ha) as compared to D3 (37.50 q/ha and 38.20 q/ha) but it was at par with D2 (41.00 q/ha and 40.20 q/ha) in both the years, respectively. The straw yield was significantly higher in I2 (45.00 q/ha and 43.50 q/ha) as compared to I1 (40.00 q/ha and 37.50 q/ha) in both the years, respectively. Harvest index was statisticallyat par under all the dates of sowing. Among the irrigationand mulch levels, differences in harvest index were no significant.

Relationship between growth parameters and grainyield

The study concludes that early sown crop produces higher tiller count, plant height, leaf area indexand dry matter production thus resulting in higher yieldand yield attributing characters. However, decreasing the irrigation level below the recommended irrigation has an adverse effect on all these parameters as the crop suffers from higher temperature as well as moisture stress during its growing period. Mulch application has a positive impact on all the yield attributing characters thereby increasing grain yield. In the present investigation it was observed that reduction in the nitrogen from NPK and the application of triazole and vitavax by seed treatment and foliar spray is very much effective to reduce the incidence of rust disease and to improve the yield and quality of Wheat. During this investigation eradication of stray was also observed.

The present study explores the information to minimise the disease incidence and improve the yield and quality of the Wheat crops by applying different methods such as dates of sowing irrigation and mulching etc.

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