Effect of organic and inorganic fertilizers on growth attributes and yield of wheat varieties in intermediate zone of Jammu, Jammu and Kashmir

SUNIL KUMAR MISHRA[1*], ABHAY KUMAR SINHA[2], NEERJA SHARMA[2] and SAURAV GUPTA[2]

[1]Division of Agronomy
Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu
Jammu 180009 Jammu and Kashmir, India
[2]ICAR – Krishi Vigyan Kendra, SKUAST – Jammu
Samba 184121 Jammu and Kashmir, India
[*]Email for correspondence: skm.kashyap@gmail.com

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ABSTRACT

A field experiment was conducted to study the effect of organic and inorganic fertilizers on the growth attributes and yield of wheat varieties in intermediate zone of Jammu, Jammu and Kashmir during winter 2018-19 and 2019-20 at Regional Agricultural Research Station Rajouri, Jammu and Kashmir. The study comprised 4 varieties (WH 1080, WH 1025, VL 907 and VL 967) in main plots and 5 levels of nutrient combinations (N_1: Control, N_2: 100% RDF, N_3: 50% RDF + 50% RDF through FYM, N_4: 50% RDF + 50% RDF through vermicompost (VC), N_5: 50% RDF + 50% RDF through FYM + 50% RDF through VC + biofertlizers). The experiment was laid out in split plot design with three replications. The pooled mean (2018-19 and 2019-20) showed that plant height (98.9 and 99.8 cm) and dry matter accumulation per plant (22.3 and 26.6 g) at 150 DAS and at harvest respectively were found significantly highest in variety VL 907 over all the varieties. Leaf area index was highest (6.3 and 3.2) in VL 907 at 120 and 150 DAS respectively. Shoot length at 120 DAS (78.9 cm) and grain yield (4,891 kg/ha) were also observed highest in VL 907. Maximum plant height (100.2 and 101.7 cm) and dry matter accumulation per plant (22.9 and 26.0 g) at 150 DAS and at harvest respectively were recorded in RDF (100%) treatment. Leaf area index (6.1 and 3.0) was maximum in RDF (100%) at 120 and 150 DAS respectively. RDF (100%) also resulted in highest shoot length (79.1 cm) at 120 DAS and grain yield (4,757 kg/ha).

Keywords: Wheat; varieties; fertilizers; INM; growth parameters; yield

INTRODUCTION

Wheat (*Triticum aestivum* L) is an important crop of northern and central India. It has highest protein, ranging from 10 to 12 per cent, among all cereals and is important for the bakery purpose. There are a variety of B vitamins in wheat such as thiamine, riboflavin, pyridoxine, niacin, pantothenic acid, biotin and folates (Batifoulier et al 2006). Wheat flour is exceptional as source of the proteins in the form of gluten that helps dough come together. Many dishes made from wheat include leavened breads, pasta, noodles, flat/pocket breads, steamed breads, biscuits, cakes and pastries. As a result, wheat, a crucial component of the diets of the majority of people on earth, plays a significant role in international trade. Of all the grains, their qualitative characteristics are the most important. India is the second largest producer of wheat with a share of around 13.53 per cent of world total production. India produced 109.59 MT in an area of 31.13 Mha with productivity of 3,521 kg per ha in 2020-21 (Anon 2023).

As the crop has a high nutrient requirement and responds positively to increased levels of chemical fertilizers, nutrient management is important for maintaining this system's productivity. Supplementing or replacing chemical fertilizers with less expensive nutrient sources like organic and biofertilizers helps to reduce the import burden and energy crisis. Globally, wheat yields have increased considerably as a result

of breeding programmes that have incorporated the short-straw trait from Mexican varieties. Such varieties are more responsive to applied nutrients and are also more resistant to lodging as compared to the local wheat varieties (Büchi et al (2016). Prasanna et al (2014) found that *Azotobacter* and *Azospirillum* can fix15-20 kg and 20-30 kg N per ha respectively, under field conditions, thus saving the cost of fertilizers. Since organic sources of nutrients are important constituents of integrated nutrient management, understanding of their chemical composition, decomposition and the rate of nitrogen mineralization is of utmost importance. It is necessary to use the right combination of organic and inorganic fertilizers in this endeavor to increase output while also maintaining the soil health.

MATERIAL and METHODS

A field experiment was conducted to study the effect of organic and inorganic fertilizers on the growth attributes and yield of wheat varieties in intermediate zone of Jammu, Jammu and Kashmir during winter 2018-19 and 2019-20 at Regional Agricultural Research Station Rajouri, Jammu and Kashmir situated at 33.38° N latitude and 74.3° E.

The study comprised 4 varieties (WH 1080, WH 1025, VL 907 and VL 967) in main plots and 5 levels of nutrient combinations (N_1: Control, N_2: 100% RDF, N_3: 50% RDF + 50% RDF through FYM, N_4: 50% RDF + 50% RDF through vermicompost (VC), N_5: 50% RDF + 50% RDF through FYM + 50% RDF through VC + biofertlizers). The experiment was laid out in split plot design with three replications. The soil of the experimental plot was clay loam in texture and slightly alkaline in reaction with pH 7.8 and EC of 0.17 dS per m. Soil of the experimental plot was analysed as per Piper (1950). It was low in available nitrogen (107.8 kg/ha) and medium in available phosphorus (25.4 kg/ha), iron (13.45 ppm), manganese (2.85 ppm), zinc (1.76 ppm) and copper (1.37 ppm) and high in available potassium (313.2 kg/ha).

RESULTS and DISCUSSION

Effect of varieties

The pooled mean (2018-19 and 2019-20) data show that plant height (98.9 and 99.8 cm) and dry matter accumulation per plant (22.3 and 26.6 g) at 150 DAS and at harvest respectively were found significantly higher in variety VL 907 over all the varieties (Table 1). The minimum pooled mean plant height (94.2 and 96.8 cm) and dry matter accumulation per plant (20.8 and 24.2 g) at 150 DAS and at harvest respectively were recorded in variety WH 1025. The varietal difference with different varieties was also reported by Khan et al (2017). Leaf area index was highest (6.3 and 3.2) in VL 907 and lowest (5.5 and 2.5) in WH 1025 at 120 and 150 DAS respectively. Shoot length at 120 DAS was also higher (78.9 cm) in VL 907 as compared to 75.5, 76.4 and 76.9 cm in WH 1025, WH 1080 and VL 967 respectively, the three being at par. Highest (4,891 kg/ha) grain yield was observed in VL 907 and lowest (3,622 kg/ha) in WH 1025.

The higher values in the growth parameters and grain yield of VL 907 might be due to its genetic makeup making it competitive for inception of solar radiation, water, space and nutrients necessary for growth over other wheat varieties. These results are in line with the findings of Chauhan et al (2020).

Effect of nutrients

The pooled mean (2018-19 and 2019-20) data given in Table 1 show that maximum plant height (100.2 and 101.7 cm) and dry matter accumulation per plant (22.9 and 26.0 g) at 150 DAS and at harvest respectively were recorded in RDF (100%) treatment and lowest plant height (91.8 and 94.8 cm) and dry matter accumulation per plant (18.2 and 23.2 g) at 150 DAS and at harvest respectively in control. Leaf area index (6.1 and 3.0) was maximum in RDF (100%) treatment and lowest (5.5 and 2.6) in control at 120 and 150 DAS respectively. RDF (100%) also resulted in highest shoot length (79.1 cm) as compared to minimum (70.6 cm) in control at 120 DAS.

Highest (4,757 kg/ha) grain yield was recorded in RDF (100%) as compared to lowest in control (4,399 kg/ha) and 50 per cent RDF + 50 per cent RDF through FYM (4,413 kg/ha), the two being at par.

Application of 100 per cent RDF through inorganic source resulted in significantly highest grain yield (4,747 kg/ha) than all other treatments. This could be due to quick release of nutrients in sufficient quantity by the fertilizers (100% RDF) during early stage of plant when nutrients are required for proper root growth and establishment. These results are in line with the findings of Hashim et al (2015) and Gadisa and Wakgari (2021). Among integrated nutrient management

Table 1. Effect of integrated nutrient management on growth attributes of wheat varieties in intermediate zone of Jammu (pooled mean of 2018-19 and 2019-20)

Treatment	Plant height (cm)		Dry matter accumulation (g/plant)		Leaf area index		Shoot length at 120 DAS (cm)	Grain yield (kg/ha)
	150 DAS	At harvest	150 DAS	At harvest	120 DAS	150 DAS		
Varieties								
WH 1080	95.8	98.3	21.5	24.8	5.7	2.7	76.4	4,745
WH 1025	94.2	96.8	20.8	24.2	5.5	2.5	75.5	3,622
VL 907	98.9	99.8	22.3	26.6	6.3	3.2	78.9	4,891
VL 967	96.3	98.5	21.4	25.0	6.0	3.0	76.9	4,806
SEm±	0.17	0.11	0.1	0.14	0.02	0.01	0.53	23.70
$CD_{0.05}$	0.61	0.40	0.38	0.49	0.09	0.04	1.88	71.25
Nutrient sources								
Control	91.8	94.8	18.2	23.2	5.5	2.6	70.6	4,399
100% RDF	100.2	101.7	22.9	26.0	6.1	3.0	79.1	4,757
50% RDF + 50% RDF through FYM	95.9	97.0	21.3	24.7	5.8	2.8	76.4	4,413
50% RDF + 50% RDF through VC	97.0	97.7	21.4	25.0	5.9	2.9	76.9	4,458
50% RDF + 50% RDF through FYM + 50% RDF through VC + biofertilizers	98.0	99.0	22.1	25.5	6.0	2.9	77.8	4,504
SEm±	0.19	0.18	0.12	0.21	0.02	0.01	0.50	17.90
$CD_{0.05}$	0.57	0.55	0.37	0.69	0.08	0.04	1.54	52.90

approach, 50 per cent RDF + 50 per cent RDF through FYM + 50 per cent RDF through vermicompost + biofertlizers gave better results over treatment 50 per cent RDF + 50 per cent RDF through FYM and 50 per cent RDF + 50 per cent RDF through vermicompost. This could be due to supply of both macro and micronutrients to plants through FYM and vermicompost during the entire growth period. FYM and vermicompost also help in improving the physical, chemical and biological properties of soil which favour better plant growth and development. Biofertlizers mineralize the fixed nutrients by releasing organic acid, thus providing nitrogen and phosphorus to the plant. Similar observation was made by Mayer et al (2015).

CONCLUSION

Based on two years pooled mean experimental results, it can be concluded that that plant height (98.9 and 99.8 cm) and dry matter accumulation per plant (22.3 and 26.6 g) at 150 DAS and at harvest respectively, leaf area index (6.3 and 3.2) at 120 and 150 DAS respectively, shoot length at 120 DAS (78.9 cm) and grain yield (4,891 kg/ha) were found significantly highest in variety VL 907. Maximum plant height (100.2 and 101.7 cm) and dry matter accumulation per plant (22.9 and 26.0 g) at 150 DAS and at harvest respectively, leaf area index (6.1 and 3.0) at 120 and 150 DAS respectively, shoot length (79.1 cm) at 120 DAS and grain yield (4,757 kg/ha) were recorded in the treatment RDF (100%).

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