

Effect of Different Foliar Application of Nutrients on Growth Characters, Yield Contributing Characters and Yield of Wheat

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Abstract

A field investigation entitled "Effect of different foliar application of nutrients on growth, yield and quality of wheat (*Triticum aestivum* L.)" was conducted in rabi season of 2022- 2023 at the Instructional Farm, Post-Graduate Institute, Mahatma Phule Krishi Vidyapeeth, Rahuri. The experiment was laid out in RBD with nine treatments replicated 3 times. All the growth contributing data viz., plant height (102.14 cm), total number of tillers (105.20 cm), dry matter (15.84 g), number of functional leaves (11.37) and leaf area plant⁻¹ were recorded significantly maximum under foliar application of nutrients. All the yield contributing characters length of panicle (9.96 cm), number of spiklets panicle⁻¹ (16.52), number of grains panicle⁻¹ (46.60), weight of grain panicle⁻¹ (1.49 g) and 100 seed weight (3.44g) were recorded significantly maximum under foliar application of nutrients. Then the highest grain yield (48.98 q ha⁻¹), straw yield (59.51 q ha⁻¹), biological yield (108.49 q ha⁻¹), harvest index (45.14%) and yield increase over control (73.16%) is obtained due to foliar application of nutrients.

Key words : Foliar, significant.

Wheat (*Triticum aestivum* L.) is the second most important cereal crop in India and plays a key role in the country's food security. Wheat is the largest cereal crop in the world. The genus *Triticum* includes the wild and domesticated species usually thought of as wheat. Wheat accounts for 20 per cent of the total calorie intake of humans. Wheat has a relatively high content of 'niacin' and 'thiamine'. It contains the characteristic substance 'gluten', which gives the spongy cell structure of bread, chapatti and other baked goods a structural framework. Contains 13 per cent protein, primarily gluten (75-80 per cent wheat protein) Contains more protein than other grains (Shewry et al., 2002).

Foliar fertilization is widely used to better manage nutritional status and growth, quickly correct deficiencies, and improve disease resistance for better crop quality. Foliar application can be considered one of the most common methods. This provided the plants with the necessary nutrients in sufficient concentra-

tions, improved the nutritional status of the plants and at the same time increased the yield and quality. Micronutrients have a significant impact on dry matter, grain yield and straw yield of wheat (Asad and Rafique, 2000). Copper plays an important role in the metabolism of N-compounds. Manganese together with zinc influences protein biosynthesis by regulating the activity of peptidases and controlling protein metabolism (Hansch and Mendel, 2009).

Material and methods

A field investigation entitled "Effect of foliar application of nutrients on growth, yield and quality of wheat (*Triticum aestivum* L.)" was conducted in rabi season of 2022- 2023 at the Instructional Farm, Post Graduate Institute, Mahatma Phule Krishi Vidyapeeth, Rahuri. The experiment consists of 9 treatments viz., T₁ : Absolute control; T₂ : Only water spray; T₃ : GRDF only (120:60:40 kg N:P₂O₅:K₂O ha⁻¹ + FYM 10 ton ha⁻¹) ; T₄ : 75 % GRDF + 2

sprays of Phule Liquid Micronutrient Grade II @ 1% at 45 DAS and 65 DAS ; T₅ : 75% GRDF + 2 Foliar spray of 19:19:19 @ 1% 45 DAS and 65 ; T₆ : 75% GRDF + 1 foliar spray of Phule Liquid Micronutrient Grade II @ 1% and 1 Foliar spray of 19:19:19@ 1% 45 DAS and 65 ; T₇ : 50% GRDF + 2 Foliar spray of 19:19:19 @ 1% 45 DAS and 65 ; T₈ : 50% GRDF + 2 sprays of Phule Liquid Micronutrient Grade II @ 1% 45 DAS and 65; and T₉ : 50% GRDF + 1 Foliar spray of 19:19:19 @ 1% 45 DAS. Line sowing of wheat seeds was done on flat beds at spacing of 20 cm x 5 cm. The mean available nitrogen, phosphorus and potassium content in soil after harvest of wheat crop were 178.36, 16.49 and 413.99 kg ha⁻¹ respectively. The recommended dose of fertilizer (120:60:40 kg N:P₂O₅:K₂O ha⁻¹) was applied 60:60:40 kg N:P₂O₅:K₂O ha⁻¹ as a basal and 60 kg N as top dressing through urea, SSP and MOP in treatment T₃ to

T₉. Thereafter, foliar application of different fertilizers was done at 25 and 40 days after sowing, respectively. Periodical observations on the growth characters, yield contributing characters, grain yield and straw yield were recorded during investigation.

Results and Discussion

Growth Parameters : The growth performance of wheat crop at 30 DAS was almost uniform and not influenced significantly due to foliar application of nutrients at 45 DAS and 65 DAS respectively. Afterwards, the results of plant height, total number of tillers, number of functional leaves plant⁻¹, leaf area plant⁻¹ and dry matter plant⁻¹ accumulation with application of treatment T₆ i.e. 75% GRDF + 1 foliar spray of Phule Liquid Micronutrient Grade II @ 1% + 1 Foliar spray of 19:19:19 @ 1% at harvest

Table 1. Effect of different foliar application on growth contributing characters at harvest and at 90 DAS

Treatment	Growth contributing characters at harvest			Growth contributing characters at 90 DAS	
	Plant height (cm)	Total no. of tillers	Dry matter plant ⁻¹ leaves plant ⁻¹	No. of functional (dm ²)	Leaf area plant ⁻¹
T ₁ - Absolute control	74.97	78.50	11.65	8.04	0.81
T ₂ - Only water spray	77.80	80.34	12.08	8.56	0.84
T ₃ - GRDF only (120:60:40 kg N:P ₂ O ₅ :K ₂ O ha ⁻¹ + FYM 10 ton ha ⁻¹)	89.06	91.86	13.82	10.20	0.97
T ₄ - 75% GRDF + 2 sprays of Phule Liquid Micronutrient Grade II @ 1% at 45 DAS and 65 DAS	93.87	96.77	14.57	10.45	1.02
T ₅ - 75% GRDF + 2 Foliar spray of 19:19:19 @ 1% at 45 DAS and 65 DAS	95.27	97.86	14.75	10.57	1.03
T ₆ - 75% GRDF + 1 foliar spray of @ 1% Phule Liquid Micronutrient Grade II and 1 Foliar spray of @ 1% 19:19:19 at 45 DAS and 65 DAS	102.14	105.20	15.84	11.37	1.10
T ₇ - 50% GRDF + 2 Foliar spray of 19:19:19 @ 1% at 45 DAS and 65 DAS	83.91	86.60	13.00	9.33	0.91
T ₈ - 50% GRDF + 2 sprays of Phule Liquid Micronutrient Grade II @ 1% at 45 DAS and 65 DAS	81.95	84.60	12.72	9.12	0.89
T ₉ - 50% GRDF + 1 Foliar spray of 19:19:19 @ 1% at 45 DAS	79.53	82.14	12.37	8.82	0.86
S.E. ±	4.33	4.36	0.66	0.44	0.04
C.D.at 5%	12.70	12.81	1.95	1.31	0.13
General mean	86.50	89.31	13.42	9.60	0.93

significantly higher plant height (102.14 cm), total number of tillers (105.20), number of functional leaves plant (11.37), leaf area plant (1.10 dm²), and dry matter plant⁻¹ (15.84 g) accumulation. The highest total number of tillers, plant height, dry matter, number of functional leaves and leaf area of plant found in wheat crop might be due to addition of GRDF in conjunction with foliar spray of all necessary macro and micro nutrients and their uptake by wheat crop. It results in increased availability of all nutrients to plants and enhanced meristematic activity, cell division, enlargement and elongation of cells resulting in higher growth contributing characters. The results are in conformity with Rahman *et al.* (2014), Surve and Bhosle (2015), Yadav *et al.* (2019)), Nitharwal *et al.* (2022) and Dhaker *et al.* (2022).

Yield contributing characters : The practical way of judging the superiority of any technology lies in the evaluation of yields. In the

present study, significant differences were observed in grain and straw yield of wheat because of foliar feeding of different nutrients. Among yield contributing characters, significantly higher length of panicle (9.96 cm), number of spikelets panicle⁻¹ (16.52), number of grains panicle (46.60) and weight of grains panicle (1.49 g) were obtained with application of treatment T₆ i.e. 75% GRDF + 1 foliar spray of Phule Liquid Micronutrient Grade II @ 1% + 1 Foliar spray of 19:19:19 @ 1%. The effective absorption of nitrogen helped in formation of amino acids and boosts the production of carbohydrate. Phosphorus is vital for seed formation. Potassium plays important role in translocation of starch and protein synthesis. This was reflected in production of higher number of length of panicle, number of spikelets panicle⁻¹, number of grains panicle⁻¹, weight of grain panicle⁻¹ and number of grains panicle⁻¹ in wheat. Similar results were found by Khan *et al.* (2010), Hasina *et al.* (2011). Arif *et al.*

Table 2. Effect of different foliar application on length of panicle, mean number of spikelets panicle⁻¹, mean number of grains panicle⁻¹, mean weight of grains per panicle and 100 seed weight

Treatment	Length of panicle (cm)	No. of spikelet panicle ⁻¹	No. of grains panicle ⁻¹	Wt. of grains panicle ⁻¹ (g)	100 seed weight (g)
T ₁ - Absolute control	7.07	11.73	32.84	1.10	3.37
T ₂ - Only water spray	7.34	12.17	34.08	1.11	3.18
T ₃ - GRDF only (120:60:40 kg N:P ₂ O ₅ :K ₂ O ha ⁻¹ + FYM 10 ton ha ⁻¹)	8.56	14.20	39.75	1.29	3.35
T ₄ - 75% GRDF + 2 sprays of Phule Liquid Micronutrient Grade II @ 1% at 45 DAS and 65 DAS	8.85	14.69	41.13	1.36	3.36
T ₅ - 75% GRDF + 2 Foliar spray of 19:19:19 @ 1% at 45 DAS and 65 DAS	8.99	14.91	41.76	1.38	3.40
T ₆ - 75% GRDF + 1 foliar spray of @ 1% Phule Liquid Micronutrient Grade II and 1 Foliar spray of @ 1% 19:19:19 at 45 DAS and 65 DAS	9.96	16.52	46.60	1.49	3.44
T ₇ - 50% GRDF + 2 Foliar spray of 19:19:19 @ 1% at 45 DAS and 65 DAS	7.91	13.13	36.75	1.22	3.29
T ₈ - 50% GRDF + 2 sprays of Phule Liquid Micronutrient Grade II @ 1% at 45 DAS and 65 DAS	7.73	12.82	35.89	1.19	3.27
T ₉ - 50% GRDF + 1 Foliar spray of 19:19:19 @ 1% at 45 DAS	7.50	12.44	34.84	1.16	3.27
S.E. ±	0.43	0.71	2.04	0.06	0.05
C.D. at 5%	1.26	2.10	5.99	0.18	NS
General mean	8.21	13.62	38.18	1.25	3.32

(2006). Dhaker *et al.* (2022), Nitharwal *et al.* (2022) and Muhammad *et al.* (2019).

Yield parameter : Among all the treatments given to wheat crop, significantly higher grain yield and straw yield (48.98 and 59.51 q ha⁻¹, respectively) were recorded under the treatment T₆ i.e. 75% GRDF + 1 foliar spray of Phule Liquid Micronutrient Grade II @

nutrients is uniform throughout the vegetative growth stage of crop. Due to foliar application of nutrients, there was increase in plant height, total number of tillers, number of leaves leaf area and dry matter accumulation which may results into higher yield parameter of wheat. The results are in comparison with the results found by Rahman *et al.* (2014), Nitharwal *et al.* (2022), Vikas *et al.* (2019), Muhammad *et al.* (2006),

Table 3. Effect of different foliar application on grain yield, straw yield, biological yield, harvest index and yield increase over control of wheat

Treatments	Yield (q ha ⁻¹)			Harvest index (%)	Yield increase over control
	Grain yield	Straw yield	Biological yield		
T ₁ - Absolute control	28.22	42.34	70.56	39.99	-
T ₂ - Only water spray	28.74	43.12	71.86	40	-
T ₃ - GRDF only (120:60:40 kg N:P ₂ O ₅ :K ₂ O ha ⁻¹ + FYM 10 ton ha ⁻¹)	41.86	51.17	93.03	44.99	48.33
T ₄ - 75% GRDF + 2 sprays of Phule Liquid Micronutrient Grade II @ 1% at 45 DAS and 65 DAS	43.29	52.91	96.2	45	53.40
T ₅ - 75% GRDF + 2 Foliar spray of 19:19:19 @ 1% at 45 DAS and 65 DAS	43.93	53.70	97.63	44.99	55.66
T ₆ - 75% GRDF + 1 foliar spray of @ 1% Phule Liquid Micronutrient Grade II and 1 Foliar spray of @ 1% 19:19:19 at 45 DAS and 65 DAS	48.98	59.51	108.49	45.14	73.63
T ₇ - 50% GRDF + 2 Foliar spray of 19:19:19 @ 1% at 45 DAS and 65 DAS	38.69	47.29	85.98	44.97	37.10
T ₈ - 50% GRDF + 2 sprays of Phule Liquid Micronutrient Grade II @ 1% at 45 DAS and 65 DAS	37.78	46.19	83.97	45.51	33.87
T ₉ - 50% GRDF + 1 Foliar spray of 19:19:19 @ 1% at 45 DAS	35.46	43.35	78.81	81.79	25.65
S.E. ±	2.06	2.58	-	-	-
C.D.at 5%	6.05	7.59	-	-	-
General mean	38.27	48.53	86.80	48.02	-

1% + 1 Foliar spray of 19:19:19@ 1% at 45 DAS and 65 DAS .The biological yield and harvest index of the treatment T₆ i.e. 75 % GRDF + 1 foliar spray of Phule Liquid Micronutrient Grade II @ 1% + 1 Foliar spray of 19:19:19@ 1% at 45 DAS and 65 DAS is 108.49 q ha⁻¹ and 45.14%.The highest grain yield, straw yield, biological yield, harvest index and yield increase over control is obtained due to the availability of both macro and micro

Hasina *et al.* (2011), Surve and Bhosale (2015), Wagan *et al.* (2017) and Dhaker *et al.* (2022).

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