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Performances of Liquid Fertilizer on the Yield of Wheat (*Triticum aestivum* L.) var. Bijoy and Shatabdi

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ABSTRACT

The experiment was conducted during the Rabi season to study the performance of liquid fertilizer on the yield and yield components of wheat (*Triticum aestivum* L.). The experiment was laid out in a randomized complete block design and comprised of two varieties viz. Bijoy and Shatabdi with ten fertilization levels. With few exceptions, the yield and yield components were significantly influenced by the variety and different levels of liquid fertilizer application. Among two varieties, Bijoy gave higher yield and yield components with the parameters of plant height (104.00 cm), total tillers plant^{-1} (4.86), effective tillers plant^{-1} (4.37), spikelets spike^{-1} (18.46), fertile spikelets spike^{-1} (15.68), grains spike^{-1} (54.99), 1000-grain weight (45.76 g), grain yield (4.86 t ha^{-1}), biological yield (10.60 t ha^{-1}) and harvest index (45.94 %) when treatment T_9 (urea: 250 Kg ha^{-1} top dressing and modified magic growth: 1.2 L ha^{-1} magic growth + 1.2 Kg ha^{-1} urea + 0.8 Kg ha^{-1} MOP foliar treatmnet) was applied. The present study is concluded that magic growth treatment was better than modified magic growth and Bijoy showed better performance than Shatabdi with application of liquid fertilizer.

Key words: Bijoy, Magic growth, Shatabdi, Wheat, Yield

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1. INTRODUCTION

Wheat is one of the leading cereal crops in the world. It ranks first in terms of area (215.6 million ha.) and third terms of production (575.3 million metric ton) among the grain crops in the world (FAOSTAT, 2012). It is the major food crop for about one third of the world populations. However, it is second important cereal crop of Bangladesh. The annual production of wheat in 2012-2013 was 8.49 lakh tons obtained from 3.94 lakh ha. in Bangladesh. Average yield of wheat in Bangladesh is low compared to other wheat growing countries of the world. The average yield of wheat is 7.50, 6.20 and 4.80 t/ha in Holland, UK and France respectively, whereas it is only 2.15 t/ha in Bangladesh (FAOSTAT, 2012). It is one of the best sources of carbohydrate and, contains considerable amount of the proteins, minerals and vitamins.

Bangladesh has been facing serious food deficit every year. As such the government has to import food grain specially wheat to meet up this shortage. The alternative feasible approach in solving the chronic food shortage have to increase the per hector yield of wheat. Intensive cropping, imbalanced fertilization, unscientific method of fertilizer application, less or no use of organic manures have resulted the depletion of soil fertility in Bangladesh, is resulting low

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yield crops. Due to over population growth and change in the food habit of Bangladesh, it is increased using more wheat consumption, therefore the demand of wheat increases day by day. At present, a high attention is being paid to the production of wheat.

The experimental site is located under High Ganges River Flood plain soil included Agro-Ecological Zones (AEZ)-11 among 30 AEZ in Bangladesh, which is one of the most important calcareous soil containing large amount of $CaCO_3$ as well as high concentration of Ca^{2+} (BBS, 1996). Other macro and micro nutrients which are required for successful growth and development of wheat, are less available. The yield and yield components of wheat increased with the foliar application of various fertilizers. Plant nutrient solution sprayed on plant foliage can be quickly absorbed (Jamal et al., 2006). Yield and yield components of high yielding varieties generally increase by increasing level of macro nutrients (Behera et al., 2000). The investigation was therefore, undertaken to find out the effect of foliar applications of liquid fertilizer on yield and yield components of wheat.

2. MATERIALS AND METHODS

The research work was carried out at the experimental field of Department of Agronomy and Agricultural Extension, University of Rajshahi during 2017-18 year to study the performances of liquid fertilizer (magic growth) on yield and yield components of wheat.

The experimental field was under the AEZ-11, was characterized a high land with sandy loam textured soil having pH 8.10 (BBS, 1996). In the experimental field, the chemical characteristics of soil was carried out by our experiments where 7.5 p^H, 0.084% nitrogen, 11.25 ppm P (approx), 35.54 K cmol/kg (approx), 24.36 ppm S (approx), 35.024 ppm Zn (approx) and 25.45 ppm B (approx) were obtained. The climate around the experimental field belongs to AEZ-11, was tropical monsoon accompanied by distinct season.

During the land preparation, fertilizers used in the experimental field as basal doses: 135 kg ha^{-1} TSP, 98 kg ha^{-1} MOP, 113 kg ha^{-1} gypsum and 7.5 kg ha^{-1} boric acid. The whole amount of TSP, MOP, gypsum and boric acid were applied during the land preparation but urea was not applied on that time. Urea was applied as top dressing in the time of cultivation. The first split of urea was applied just before the seed sowing. The second split of urea was also top dressing which was applied during first irrigation (CRI stage, after 20 days of seed sowing) and the third split of urea as top dressing applied at second irrigation (after 55 days of seed sowing). Splits of urea showed in Table 1. Two factors were evaluated in the present experiment. One factor was variety and another was liquid fertilizer (magic growth or it modified form) treatments. The experimental varieties were Bijoy and Shatabdi. The fertilizer treatments are given in Table 1.

The experiment was laid out in a randomized complete block design (RCBD) with three replications (blocks). Each block was divided into ten plots for each variety. In the entire experiment, the number of plots was 30 per each variety. For two varieties, it was designated as 2 varieties x 3 replications x 10 fertilizer treatments. The unit plot size was 2m x 2m. The plot to plot distance was 0.5m and the block to block distance was 1.0m. Liquid fertilizers i.e. magic growth (Table 2) and modified magic growth (1.2 L ha^{-1} magic growth + 1.2 Kg ha^{-1} urea + 0.8 Kg ha^{-1} MOP mixed with 400L water) was sprayed three times viz. 1st time at 35 days after seed sowing (jointing stage), 2nd time at 55 days

Table 1: Fertilizer treatments applied during cultivation of wheat variety Bijoy and Shatabdi.

Treatments	Top dressing (urea kg ha^{-1})				Foliar application	
	Total	Split 1	Split 2	Split 3	(MG) L ha^{-1}	(MMG) L ha^{-1}
T_1	-	-	-	-	-	-
T_2	150	88	62	-	-	-
T_3	150	88	62	-	-	*
T_4	175	75	62	38	-	-
T_5	175	75	62	38	-	*
T_6	225	88	75	62	-	-
T_7	225	88	75	62	-	*
T_8	250	88	86	76	-	-
T_9	250	88	86	76	-	*
T_{10}	250	88	86	76	**	-

(-) no fertilizer application.
** Magic growth (MG) = 1.2 L ha^{-1} magic growth mixed with 400L water.
* Modified magic growth (MMG) = 1.2 L ha^{-1} magic growth + 1.2 Kg ha^{-1} urea + 0.8 Kg ha^{-1} MOP mixed with 400L water.

after seed sowing (booting stage) and 3rd time at 75 days after seed sowing (flowering stage). Modified magic growth was involved in T_3, T_5, T_7 and T_9 treatments and magic growth was involved in T_{10} only (Table 1). Spray was done in afternoon to avoid sun burn. The collected data were analyzed statistically using the statistical package "MSTAT-C". The mean differences were adjudged by Duncan's Multiple Range Test (DMRT). Simple correlation coefficient was done to determine the relationships between grain yield and yield components with the help of computer package SPSS.

Table 2. Chemical composition of magic growth.

Elements	Amount (%)
Total Nitrogen (N)	10.51
Phosphorus (P)	5.58
Potassium (K)	6.33
Sulphur (S)	0.10
Zinc (Zn)	0.16
Copper (Cu)	0.04
Iron (Fe)	0.0006
Manganese (Mn)	0.006
Boron (B)	0.25
Calcium (Ca)	0.07
Magnesium (Mg)	0.007
pH	1.0

Magic Growth is a liquid fertilizer invented by Md. Arif Hossain Khan, Joint Director (Seed Marketing), Bangladesh Agricultural Development Corporation (BADC) which is ready for government recognition.

3. RESULTS AND DISCUSION

Effect of variety on the yield and yield components of wheat

The yield and yield components of wheat was affected by variety. From the result of plant height, it was observed that the plant height (101.36 cm) was taller in Bijoy than the plant height (87.31 cm) of Shatabdi and it was significantly differed within two varieties. The number of total tillers plant^{-1}, effective tillers plant^{-1}, spikelets spike^{-1}, fertile spikelets spike^{-1}, grains spike^{-1}, spike length, 1000-grain weight, grain yield, straw yield, biological yield and harvest index were 4.08, 3.28, 17.30, 14.28, 48.21, 16.58 cm, 44.17 g, 3.63 t ha^{-1}, 5.11 t ha^{-1}, 8.73 t ha^{-1} and 41.65%, respectively obtained in Bijoy (Table 3). On the other hand, the number of total tillers plant^{-1} (3.85), effective tillers plant^{-1} (3.16), spikelets spike^{-1} (17.06), fertile spikelets spike^{-1} (13.71), grains spike^{-1} (46.40), Spike length (16.40cm), 1000-grain weight (44.03g), grain yield (3.37 t ha^{-1}), straw yield (5.10 t ha^{-1}), biological yield (8.49 t ha^{-1}) and harvest index (39.71%) were found in Shatabdi. Results revealed that higher effect in the number of total tillers plant^{-1}, effective tillers plant^{-1}, spikelets spike^{-1}, fertile spikelets spike^{-1} and grain spike^{-1}, 1000-grain weight, grain yield, straw yield, biological yield and harvest index were showed in Bijoy than that of Shatabdi. The significant differences were observed in some parameters like plant height, total tillers plant^{-1}, effective tillers plant^{-1}, fertile spikelets spike^{-1}, grain spike^{-1}, grain yield and harvest index between Bijoy and Shatabdi. It was not observed in the spikelets spike^{-1}, spike length, 1000-grain weight, straw yield and biological yield. Rahman et al. (2010) observed that total number of tiller was significant in different varieties of wheat. They also stated significant variation among the varieties in respect of effective tillers plant^{-1}, fertile spikelets spike^{-1}, grains spike^{-1}, biological yield and harvest index. Stoppler et al. (1990) and Hossain et al. (2006) observed that the number of grains spike^{-1} and grain yield significantly varied in different wheat varieties. They also observed that variety did not show significant effect in spike length, 1000-grain weight, straw yield and biological yield of wheat. The present experimental results closely agree with the observation of Alam et al. (2007). The variation within varieties in the yield and yield components may be showed due to the genetic makeup of varietal difference.

Effect of liquid fertilizer on the yield and yield components of wheat

The number of total tillers plant^{-1}, effective tillers plant^{-1}, spikelets spike^{-1}, fertile spikelets spike^{-1}, grains spike^{-1}, spike length, 1000-grain weight, grain yield, straw yield, biological yield and harvest index were significantly influenced by fertilizer treatments. The tallest plant (100.36cm) was obtained in T_9 and the shortest plant structure (90.96cm) was produced in control dose (T_1) (Table 4). The highest number of total tillers plant^{-1} (4.56), effective tillers plant^{-1} (4.16), spikelets spike^{-1} (18.13), fertile spikelets spike^{-1} (15.35), grains spike^{-1} (53.59), longest spike length (16.97cm), 1000-grain weight (45.48g), grain yield (4.65 t ha^{-1}), straw yield (5.86 t ha^{-1}), biological yield (10.51 t ha^{-1}) and harvest index (44.26%) were obtained in T_9 treatment and the lowest number of total tillers plant^{-1} 3.33, effective tillers plant^{-1} 2.25, spikelets spike^{-1} 16.30, fertile spikelets spike^{-1} 12.49, grains spike^{-1} 40.78, shortest spike length 15.73cm, 1000-grain weight 40.91g, grain yield 2.13 t ha^{-1}, straw yield 2.75tha^{-1}, biological yield 4.88 t ha^{-1} and harvest index 34.20% were found in control dose (T_1) (Table 4). In T_2, T_4, T_6 and T_8 treatments, urea as top dressing was used only. On the other hand, T_3, T_5, T_7 and T_9 treatments contained top dressing and modified magic growth as foliar spry. When compare among the above treatments (T_2 - T_9), the results of yield and yield components showed better in the presence of foliar spry (T_3, T_5, T_7 and T_9). The foliar spray of modified magic growth (T_9) showed higher performance in yield and yield components than magic growth (T_{10}) spray only. From above results, it was clarified that foliar spray of liquid fertilizer influenced the yield and yield components. Between two types of foliar spray, modified magic growth showed the better results. The application of magic growth liquid fertilizer showed positive effect on the yield and

Table 3. Effect of variety on the yield and yield components of wheat variety Bijoy and Shatabdi.

Parameters	Bijoy	Shatabdi	CV (%)
Plant height (cm)	101.367a*	87.317b*	3.82
Total tillers plant^{-1} (number)	4.080a*	3.853b*	5.36
Effective tillers plant^{-1} (number)	3.281a**	3.163b**	6.72
Spikelets spike^{-1} (number)	17.303^{NS}	17.060 ^{NS}	4.16
Fertile spikelets spike^{-1} (number)	14.289 a*	13.712b*	5.24
Grains spike^{-1} (number)	48.210a**	46.408b**	6.46
Spike length (cm)	16.580 ^{NS}	16.400 ^{NS}	3.50
1000- grain weight (g)	44.170 ^{NS}	44.038 ^{NS}	3.65
Grain yield (t ha^{-1})	3.630a*	3.377b*	4.19
Straw yield (t ha^{1})	5.117 ^{NS}	5.106 ^{NS}	11.37
Biological yield (t ha^{-1})	8.736 ^{NS}	8.493 ^{NS}	6.81
Harvest index (%)	41.655 a**	39.716b**	7.36

In a row, means followed by a similar letter(s) are not significantly different whereas, means followed by a dissimilar letter(s) are significantly different as per DMRT, CV: Co-efficient of variation, *: Significant difference at 1% Level of significance, **: Significant difference at 5% Level of significance, ^{NS}: Non- significant.

nutrient content of Aman rice cultivars (Rabin et al., 2016). This result is in the observation with Soylu et al. (2005) and Guenis et al. (2003) who reported significant increase in 1000-grain weight of wheat with foliar application of nutrients. Similar to results obtained in this study showed that grain yield increased in wheat with the application of liquid fertilizer. It might be due to positive contribution of main yield contributing characters to higher grain yield. In control T_1, the growth and development of plants hampered due to imbalance uptake of essential elements which ultimately resulted in poor performance of yield attributes and produced the lowest grain yield of wheat (Otteson et al. 2007; Staggenborg et al. 2003). It might be due to lowest plant height and less number of effective tillers plant^{-1}. T_9 had highest biological yield this is because of higher production of grain and straw yield. T_1 had lowest biological yield this is because of lower production of grain and straw yield.

Interaction effects in variety and liquid fertilizer on the yield and yield components of wheat

The interaction effect in variety and liquid fertilizer had significantly influenced on the seven parameters such as total tillers plant^{-1}, effective tillers plant^{-1}, spikelets spike^{-1}, grains spike^{-1}, 1000-grain weight, grain yield and straw yield in wheat (Kumar et al., 2007). In the present study, the significant interactions were observed within both varieties and treatments in seven parameters like total tillers plant^{-1}, effective tillers plant^{-1}, spikelets spike^{-1}, grains spike^{-1}, 1000-grain weight, grain yield and straw yield. The interaction effects at significant parameters in number of total tillers plant^{-1} (4.86), effective tillers (4.37), spikelets spike^{-1} (18.46), grains spike^{-1} (54.99), 1000-grain weight (45.76g), grain yield (4.86 t ha^{-1}) and Straw yield (5.73 t ha^{-1}) were obtained within interaction of Bijoy and T_9 (Bijoy x T_9) and they showed highest level among all interactions of Bijoy and treatments. When considered the interaction of Bijoy and without liquid fertilizer i.e. control dose (Bijoy x T_1), the number of total tillers plant^{-1} (3.40), effective tillers (2.27), spikelets spike^{-1} (16.80), grains spike^{-1} (42.52), 1000-grain weight (41.13g) grain yield (2.30 t ha^{-1}) and straw yield (2.63 t ha^{-1}) performed the lowest levels. On the other hand, in case of Shatabdi variety the lowest significant interactions in the number of total tillers plant^{-1} (3.26), effective tillers plant^{-1} (2.24), spikelets spike^{-1} (15.80), grains spike^{-1} (39.04), 1000-grain weight (40.68g), grain yield (1.96 t ha^{-1}) and Straw yield (2.86 t ha^{-1}) were obtained in the interaction of variety Shatabdi and control dose (Shatabdi x T_1) (Table 5). Whereas, Shatabdi gave the highest significant interactions in the number of total tillers plant^{-1} (4.26), effective tillers (3.96), spikelets spike^{-1}(17.80), grains spike^{-1} (52.20), 1000-grain weight (45.20g), grain yield (4.43t ha^{-1}) and straw yield (6.00 t ha^{-1}) at the interaction effect of (Shatabdi x T_9)(Table 5). The interaction (Bijoy x T_9) performed higher than the interaction (Shatabdi x T_9). This result suggests that Bijoy showed better performances in the yield and yield components. It is also suggested that treatment with liquid fertilizer (modified magic growth) performed better that treatment without liquid fertilizer.

Simple correlation within parameters of yield and yield components

The degrees of relationship were examined within three parameters separately like, effective tillers plant^{-1}, number of grains spike^{-1} and 1000-grain weight considered with single parameter grain yield (Fig. 1, 2, and 3). The correlation between effective tillers plant^{-1} and grain yield was shown in Fig. 1. The result revealed that effective tillers plant^{-1} and grain yield have a positive relationship. The correlation co-efficient was r = 0.891. The positive slope indicates positive relationship which means that an increase in the number of effective tillers plant^{-1} will lead to an increase in grain yield.When the degree of relationship measured between grain yield and the number of grains spike^{-1} as well as 1000-grain weight, positive correlation co-efficient in both cases

Table 4. Effect of liquid fertilizer on the yield and yield components of wheat.

Treatments	Plant height (cm)	Total tillers number plant^{-1}	Effective tillers number plant^{-1}	Spikelets number spike^{-1}	Fertile spikelets number spike^{-1}	Grains number spike^{-1}	Spike length (cm)	1000- grain weight (g)	Grain yield (t ha^{-1})	Straw yield (t ha^{1})	Biological yield (t ha^{-1})	Harvest index (%)
T_1	90.96b	3.33f	2.25g	16.30c	12.49d	40.78f	15.73c	40.91c	2.13h	2.75c	4.88d	43.68a
T_2	91.25b	3.46ef	2.57fg	16.65bc	13.01d	43.31ef	16.01bc	42.41bc	2.56g	5.06ab	7.63c	34.20c
T_3	91.70b	3.70de	2.81ef	16.83bc	13.32cd	44.92def	16.23abc	43.13abc	2.91f	5.00ab	7.91c	36.88bc
T_4	92.43b	3.83cd	2.99de	16.93abc	13.60bcd	45.43def	16.47ab	44.12ab	3.25e	4.71b	7.96c	40.91ab
T_5	93.60b	3.86cd	3.03de	17.16abc	13.72bcd	46.37cde	16.52ab	44.61ab	3.70d	5.40ab	9.10b	40.69ab
T_6	94.60ab	4.00bcd	3.21cd	17.16abc	14.40abc	47.18be	16.64ab	45.30a	3.80cd	5.32ab	9.12b	41.68ab
T_7	95.53ab	4.10bc	3.49bc	17.36abc	14.47abc	48.92ad	16.67ab	44.90ab	3.86cd	5.68ab	9.55b	40.54ab
T_8	96.00ab	4.30ab	3.65b	17.60ab	14.83ab	50.68abc	16.79a	45.03ab	4.03bc	5.61ab	9.65ab	41.93ab
T_9	100.36a	4.56a	4.16a	18.13a	15.35a	53.59a	16.97a	45.48a	4.65a	5.86a	10.51a	44.26a
T_{10}	96.96ab	4.50a	4.00a	17.66ab	14.77ab	51.86ab	16.83a	45.12ab	4.11b	5.68ab	9.80ab	42.04ab
Significance	0.01	0.01	0.01	0.01	0.01	0.01	0.05	0.01	0.01	0.01	0.01	0.01
CV (%)	3.82	5.36	6.72	4.16	5.24	6.46	3.50	3.65	4.19	11.37	6.81	7.36

In a column, means followed by a similar letter(s) are not significantly different whereas, means followed by a dissimilar letter(s) are significantly different as per DMRT., CV : Co-efficient of variation.

Table 5. Interaction effect within variety and liquid fertilizer on the yield and yield components of wheat.

Interaction (variety× treatment)	Plant height (cm)	Total tillers number plant^{-1}	Effective tillers number plant^{-1}	Spikelets number spike^{-1}	Fertile spikelets number spike^{-1}	Grains number spike^{-1}	Spike length (cm)	1000- grain weight (g)	Grain yield (t ha^{-1})	Straw yield (t ha^{1})	Biological yield (t ha^{-1})	Harvest index (%)
Bijoy x T_1	99.53	3.40de	2.27gh	16.80d	13.02	42.52lm	16.10	41.13ef	2.30cde	2.63de	4.93	46.61
Bijoy x T_2	99.60	3.60 d	2.62 fg	16.83cde	13.39	44.91j	16.14	42.39e	2.86cd	5.06a-e	7.93	36.20
Bijoy x T_3	100.00	3.80cde	2.83 ef	16.93cde	13.71	45.48ij	16.17	43.04def	2.93c	5.16a-d	8.10	36.26
Bijoy x T_4	100.93	3.86cd	2.99 de	17.06cd	13.84	46.04hij	16.19	44.26cde	3.40bc	4.53bc	7.93	42.98
Bijoy x T_5	101.66	3.86 cd	2.99 de	17.06cd	13.95	46.70h	16.26	44.74c	3.83b	5.33abc	9.16	41.86
Bijoy x T_6	101.66	4.00c	3.20 d	17.06cd	14.65	47.75gh	16.39	44.94bcd	3.86b	5.45abc	9.32	41.53
Bijoy x T_7	101.66	4.20bc	3.60 c	17.40bcd	14.73	50.46de	16.42	45.03bc	3.90b	5.76ab	9.66	40.38
Bijoy x T_8	101.66	4.40 c	3.71bc	17.66b	15.04	51.16cde	16.65	45.17b	4.13abc	5.60ab	9.73	42.60
Bijoy x T_9	104.00	4.86a	4.37a	18.46a	15.68	54.99a	16.95	45.76a	4.86a	5.73ab	10.60	45.94
Bijoy x T_{10}	102.9	4.80a	4.21ab	17.73bc	14.84	52.06bcd	16.71	45.20b	4.20abc	5.76ab	9.96	42.15
Shatabdi x T_1	82.40	3.26 e	2.24gh	15.80e	11.96	39.04op	15.36	40.68f	1.96d	2.86d	4.83	40.75
Shatabdi x T_2	82.90	3.33 de	2.53fgh	16.46def	12.64	41.70m	15.88	42.43e	2.26cde	5.06ae	7.33	32.19
Shatabdi x T_3	83.40	3.60 d	2.80f	16.73de	12.93	44.37jk	16.30	43.22de	2.90c	4.83b	7.73	37.50
Shatabdi x T_4	83.93	3.80 cde	3.00de	16.80d	13.36	44.82j	16.76	43.98d	3.10bcd	4.90b	8.00	38.85
Shatabdi x T_5	85.53	3.86 cd	3.08de	17.26c	13.48	46.05hij	16.78	44.48cd	3.56bc	5.46abc	9.03	39.53
Shatabdi x T_6	87.53	4.00c	3.23cde	17.26c	14.15	46.61hi	16.89	45.67a	3.73bc	5.20abc	8.93	41.83
Shatabdi x T_7	89.40	4.00c	3.38ed	17.33 bcd	14.22	47.38gh	16.92	44.76c	3.83b	5.60ab	9.43	40.69
Shatabdi x T_8	90.33	4.20bc	3.59c	17.53bc	14.62	50.21de	16.93	44.90c	3.93b	5.63ab	9.56	41.25
Shatabdi x T_9	96.73	4.26bc	3.96 abc	17.80abc	15.02	52.20bc	17.00	45.20b	4.43ab	6.00a	10.43	42.58
Shatabdi x T_{10}	91.00	4.20 bc	3.80 bc	17.60b	14.71	51.66cd	16.96	45.03bc	4.03b	5.60ab	9.63	41.94
Significance	NS	0.05	0.05	0.05	NS	0.05	NS	0.05	0.05	0.05	NS	NS
CV (%)	3.82	5.36	6.72	4.16	5.24	6.46	3.50	3.65	4.19	11.37	6.81	7.36

In a column, means followed by a similar letter(s) are not significantly different whereas, means followed by a dissimilar letter(s) are significantly different as per DMRT. CV: Co-efficient of variation; NS: Non-significant.

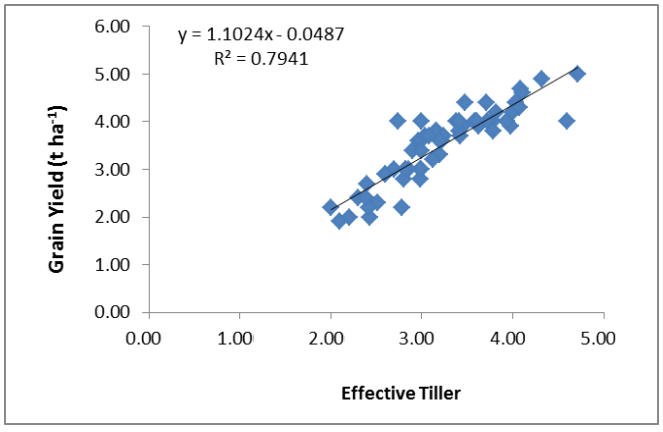

Fig. 1 Relationship between number of effective tillers plant^{-1} and grain yield of wheat.

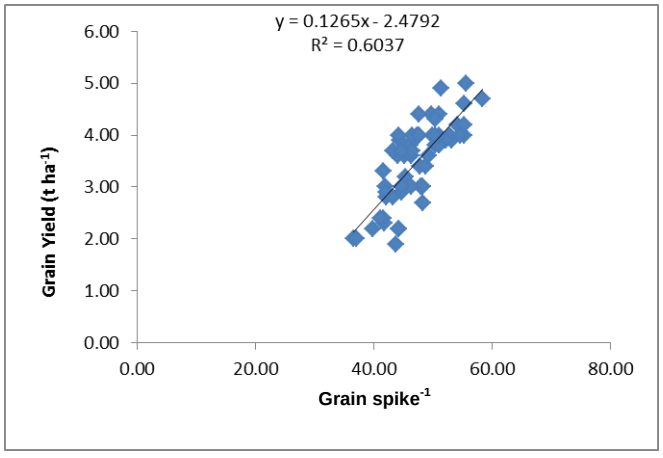

Fig. 2 Relationship between number of grains spike^{-1} and grain yield of wheat.

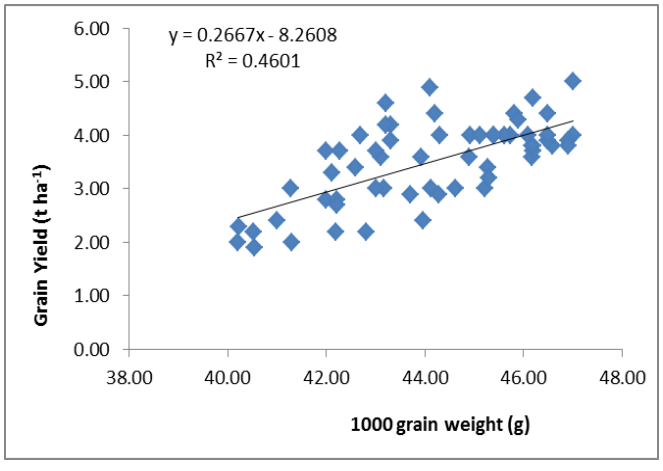

Fig. 3 Relationship between 1000-grain weight and grain yield of wheat.

were obtained r = 0.777 and r = 0.678, respectively (Fig. 2, 3). It is suggested that an increase in number of grains spike^{-1} and 1000-grain weight will lead to an increase in grain yield.

4. CONCLUSION

Based on the result of the present study, it can be concluded that T_9 treatment (including foliar application by modified magic growth: 1.2 L ha^{-1} magic growth + 1.2 Kg ha^{-1} urea + 0.8 Kg ha^{-1} MOP mixed with 400 L water) will be an optimum fertilization for profitable cultivation of wheat. Although the application of magic growth increased the wheat yield, the addition of urea and MOP to magic growth increased the yield and yield components more. Thus, in order to increase wheat production, it can be suggested to the farmers to use not only magic growth but also add recommended amount of urea and MOP for maximizing yield of wheat so that, farmers as well as the whole nation will be benefited. However, further studies are necessary to draw a definite conclusion.

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