

A STUDY ON YIELD LEVELS OF WHEAT AS AFFECTED BY FLOBOND UNDER DIFFERENT IRRIGATION REGIMES

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ABSTRACT

A pot experiment was conducted at the Net house of Department of Agronomy, Bangladesh Agricultural University, Mymensingh to study the effects of rate of flobond and level of irrigation on yield dimensions of wheat cv. BARI GAM-19 (Sourov). The experiment comprised of two factors (a) rate of flobond viz., 0, 0.5, 1.0, 2.0, 4.0 and 8.0 g pot⁻¹ and (b) three level of irrigation viz., control, one irrigation at 18 DAS, two irrigation at 18 and 55 DAS, three irrigation at 18, 55 and 80 DAS. The experiment was laid out in a completely randomized design with three replications. The study explored that the grain yield of wheat (21.38 g pot⁻¹/3.06 t ha⁻¹) was found highest with 2 g flobond pot⁻¹ (332 kg ha⁻¹). Biological yield (8.41 t ha⁻¹) and straw yield (38.14 g pot⁻¹/5.45 t ha⁻¹) were highest with 4 g flobond pot⁻¹ (664 kg ha⁻¹). On the other hand, all types of yield and harvest index were lowest with no flobond. Again considering irrigation levels, the grain yield (23.88 g pot⁻¹/3.41 t ha⁻¹), biological yield (8.26 t ha⁻¹) and harvest index (41.40%) were highest with two irrigations treatment. Only straw yield (34.15 g pot⁻¹/4.88 t ha⁻¹) was highest under three irrigations. All types of yield and harvest index were lowest with no irrigation. Considering interaction effects, the straw yield was higher (5.75 t ha⁻¹) with 4 g flobond pot⁻¹ (664 kg ha⁻¹) with two irrigations and the lowest one (21.50 g pot⁻¹/4.47 t ha⁻¹) was found in no flobond and no irrigation. Harvest index (43.85%) was higher with 2 g flobond pot⁻¹ (332 kg ha⁻¹) with two irrigations. All most all types of yield and other yield characters were lowest in no flobond and no irrigation.

Key words: Wheat yield, flobond, irrigation regimes.

Introduction

Wheat is one of the most important staple food grains of mankind. In fact, in worldwide more than two-thirds of the wheat produced is used as food. In addition to being a major source of starch and energy, wheat provides substantial amounts of nutrients essential or beneficial to health, particularly protein, vitamins (notably B vitamins), dietary fiber, and phyto-chemicals. It is the matter of sorrow that per ha yield of wheat in Bangladesh is low in comparison to that of other wheat growing countries of the world. Of the total wheat area in Bangladesh, 44.2% is irrigated and the rest is rainfed (BBS, 1996). Irrigation at optimum level is one of the most important tools for boosting up the yield of wheat (Razzaque *et al.*, 1992). Movement of nutrients through the plant body by physiological activities is also associated with soil water (Tisdale *et al.*, 1985). But as a matter of fact, irrigation water in Bangladesh is a limited resource and hence irrigation practices must be rationalized for high water use efficiency. The farmers spend a considerable amount of money for irrigation purposes. But by using chemical water retainer like flobond they can save water and reduce the irrigation cost. Flobond has no toxic effect on crop, water and soil. The product is approved in the USA. Flobond increases the cohesion of poorly structured soils (which reduced 95% soil erosion), improved in germination rate about 35%, reduces leaching of nutrients (e.g. 84% less for phosphates and nitrates) and the porosity of the soil is also conserved (35% on clay-loam soils to +50% on clay soils). The duration of field efficacy of flobond very strong 4 to 8 weeks depending on the agro-climatic condition. Flobond economizes the use of water, reduces cost of cultivation and maximize crop

yield without affecting the health of ecosystem. Parvej *et al.* (2019) studied that flobond, a chemical water retainer had remarkable positive effects on growth, development and productivity of wheat cv. Shatabdi by using nitrogen fertilizer. Flobond can be used in wheat cultivation for retaining irrigation water and other sources of soil water for the period as mentioned above, thereby save the scarce resource and minimizes the extra cost for irrigation as well improve the growth and yield, respectively. This study will focus the role of flobond for enhancing the different yield dimensions under irrigation uses in wheat field of Bangladesh.

Materials and Methods

A modern wheat variety BARI GAM-19 (Sourov) was grown with six rates of Flobond, a chemical water retainer, viz., 0.0, 0.5, 1.0, 2.0, 4.0 and 8.0 g pot⁻¹ under three levels of irrigation viz., control, one irrigation at 18 DAS (days after sowing), two irrigations at 18 DAS and 55 DAS, three irrigations at 18 DAS, 55 DAS and 80 DAS at the net house of the Department of Agronomy, Bangladesh Agricultural University, Mymensingh during the *Rabi* season. The experiment was laid out in a completely randomized design with three replications. The total numbers of experimental pot were 72 (6 x 4 x 3). The depth and diameter of each pot was 16.5 and 27.0 cm, respectively. The soils were collected from different location from Agronomy field laboratory. Then each pot was fertilized with urea, triple superphosphate, muriate of potash and zinc sulphate at the rate of 1.25 g, 1.0g, 1.39g and 0.28 g pot⁻¹. Triple super phosphate, muriate of potash, zinc sulphate and two-thirds urea were applied as basal dose i.e. mixed with soil before putting into pots. Rest one-thirds urea was applied at first irrigation. Flobond was applied in each group as per treatment. A total of 72 pots were filled up with soil (6 kg pot⁻¹) followed by leveling. Five seeds were sown in each pot. Irrigation were applied as per treatments. Weeding and pest management were done as when as necessary. At maturity yield, yield contributing and other crop characters were recorded. Three plants from each pot were uprooted for recording necessary data. The data on different yield, yield contributing and other crop characters were recorded from each pot. Data were analyzed using the “Analysis of Variance” technique and mean difference were recognized by DMRT.

Results and Discussion

Effect of rate of Flobond

Flobond had significant effect on grain yield. From the experiment it is clear that the highest grain yield (21.38 g pot⁻¹/3.06 t ha⁻¹) was found with 2 g Flobond pot⁻¹. It was statistically identical with 4 g Flobond pot⁻¹ (20.70 g pot⁻¹ /2.96 t ha⁻¹) and 8 g Flobond pot⁻¹ (20.84 g pot⁻¹/2.98 t ha⁻¹). The lowest grain yield (13.30 g pot⁻¹/1.90 t ha⁻¹) was found with no Flobond (Fig. 1).

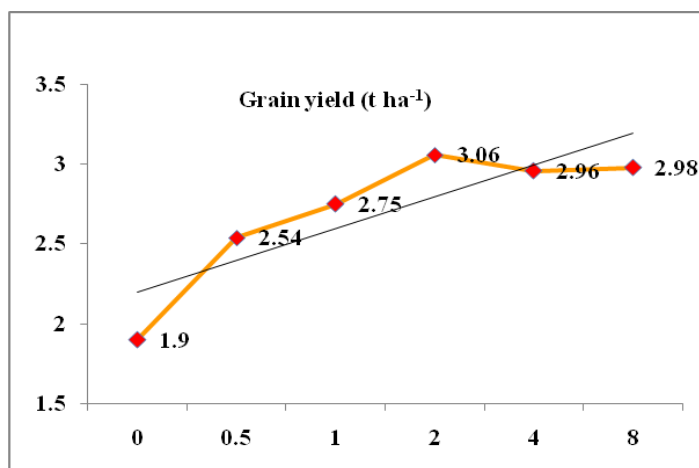


Fig. 1. Effect of flobond rate (g pot⁻¹) on grain yield of wheat

Straw yield was significantly influenced by flobond at 1% level of probability. The highest straw yield (38.14 g pot⁻¹/ 5.45 t ha⁻¹) was found with 4 g flobond pot⁻¹ and the lowest straw yield of wheat (cv. Sourov) (25.73 g pot⁻¹/3.68 t ha⁻¹) was found with no flobond (Table 1). Biological yield was significantly influenced by flobond at 1% level of probability. The highest biological yield (8.41 t ha⁻¹) was found with 4 g Flobond pot⁻¹ while the lowest biological yield (5.58 t ha⁻¹) was found with plants in pots with no flobond. Flobond exerted a significant effect also on harvest index. The highest harvest index (38.86%) was found with 8 g flobond pot⁻¹ which was statistically identical with flobond at the rate of 0.5 g (38.11%), 1 g (38.46%) and 2 g (37.71%) flobond pot⁻¹. The lowest harvest index (34.05%) was observed with 0 g flobond pot⁻¹ which was statistically identical with 4 g flobond pot⁻¹ (34.95%).

Table 1. Effect of rate of flobond on different yield dimensions of wheat cv. Sourov

Rate of flobond (g pot ⁻¹)	Straw yield (t ha ⁻¹)	Biological yield (t ha ⁻¹)	Harvest index (%)	Moisture content of soil (%)
0	3.68f	5.58f	34.04b	8.80d
0.5	3.98e	6.52e	38.11a	11.89c
1.0	4.34d	7.09d	38.46a	12.30b
2.0	5.03b	8.09b	37.71a	12.33b
4.0	5.45a	8.41 a	34.95b	13.50a
8.0	4.66c	7.64c	38.86a	13.79a
S \bar{x}	0.06	0.08	0.49	0.08
Level of significance	0.01	0.01	0.05	0.01

NS = Not significant.

In a column figures with same letter or without letter do not differ significantly whereas figures with dissimilar letters differ significantly as adjudged by DMRT.

Effect of level of irrigation

The level of irrigation significantly affected the grain yield. From the experiment it is clear that the highest grain yield (23.88 g pot⁻¹/3.41 t ha⁻¹) was found with two irrigations and on the other hand, the lower grain yield (13.65 g pot⁻¹/1.95 t ha⁻¹) was obtained with no irrigation (Fig. 2).

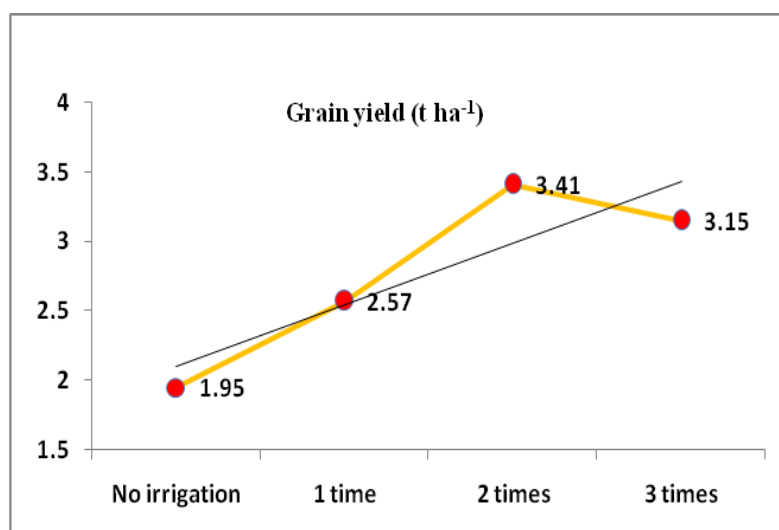


Fig. 2. Effect of irrigation levels on grain yield of wheat

English and Nakamura (1989) reported that wheat yield decreased with increasing number of irrigations due to lodging of plant. Two irrigations at tittering and flowering stages gave the highest grain yield (3.03 t/ha) of Sonalika than the all combined irrigation at tillering, flowering and dough stages (Jana and Mitra, 1989). Naser (1996) reported that two irrigations at 30 and 50 DAS significantly increased grain and straw yields over control. Straw yield was significantly influenced by level of irrigation. The highest straw yield (34.15 g pot⁻¹/4.88 t ha⁻¹) was found with three irrigations, which was statistically identical with two irrigations (33.92 g pot⁻¹/4.85 t ha⁻¹). The lowest straw yield (28.51 g pot⁻¹/4.07 t ha⁻¹) was obtained with no irrigation (Table 2). The highest straw yield of wheat was obtained with three irrigations (Singh and Uttam, 1993; Shamsuddin *et al.*, 1983). Biological yield was significantly influenced by level of irrigation. The highest biological yield (8.26 t ha⁻¹) was obtained with two irrigations, while the lowest one (6.02 t ha⁻¹) was obtained with no irrigation (Table 2). Level of irrigation excreted significant effect on harvest index at 1% level of probability. The highest harvest index (41.40%) was obtained with two irrigations and the lowest harvest index (32.31 %) was obtained with no irrigation (Table 2). Cooper (1980) reported that harvest index increased with increase in irrigation frequencies.

Table 2. Effect of level of irrigation on yield dimensions of wheat cv. Sourov

Level of irrigation	Straw yield (t ha ⁻¹)	Biological yield (t ha ⁻¹)	Harvest index (%)	Moisture content of soil (%)
0	4.07c	6.02	32.31d	8.00d
1	4.30b	6.87c	37.51c	11.75c
2	4.85a	8.26a	41.40a	12.63b
3	4.88a	8.03b	39.52b	14.20a
S \bar{x}	0.05	0.06	0.40	0.06
Level of significance	0.01	0.01	0.01	0.01

NS = Not significant.

In a column figures with same letter or without letter do not differ significantly whereas figures with dissimilar letters differ significantly as adjudged by DMRT.

Effect of interaction

Straw yield was significantly affected by the combination of rate of flobond and irrigation treatment. The highest straw yield (40.87 g pot⁻¹/5.75 t ha⁻¹) was found with of 4 g flobond pot⁻¹ under two irrigations which was statistically identical with 4 g flobond pot⁻¹ under one irrigation (40.79 g pot⁻¹/5.74 t ha⁻¹) and 2 g flobond pot⁻¹ under three irrigations (39.45 g pot⁻¹/5.63 t ha⁻¹) and 8 g flobond pot⁻¹ under three irrigations (39.46 g pot⁻¹/5.64 t ha⁻¹). The lowest of that was obtained in no flobond and no irrigation (21.50g pot⁻¹/ 3.10 t ha⁻¹) which was statistically identical with 1 g flobond pot⁻¹ in no and in no flobond under one irrigation (Table 3). The highest biological yield (9.21 t ha⁻¹) was obtained with 4 g flobond pot⁻¹ under two irrigations which was statistically identical with 2 g flobond in three irrigations (8.94 t ha⁻¹), 4 g Flobond pot⁻¹ in one irrigation (8.67 t ha⁻¹) and 8 g flobond under three irrigations (8.76 t ha⁻¹). On the other hand, the lowest biological yield (4.47 t ha⁻¹) was found in no flobond and no irrigation, which was statistically identical with the 1g flobond pot⁻¹ (4.54 t ha⁻¹) under no irrigation (Table 3). Harvest index was significantly affected by the interaction of rate of flobond and irrigation treatment. The highest harvest index (43.85%) was found with of 2 g flobond pot⁻¹ under two irrigations and the lowest one (30.18%) fromthe combination of 4 g flobond pot⁻¹ with no irrigation, which was statistically identical with no flobond under no irrigation (30.64%) (Table 3).

Effect on Moisture Percentage in Soil

Flobond as chemical water retainer had significant effects on moisture percentage of soil (Tables 1-3). The highest moisture percentage (13.79%) was found with 8 g flobond pot⁻¹ which was statistically identical

with 4 g flobond pot⁻¹ (13.50%) and the lowest one (8.80%) was found with no flobond (Table 1). Level of irrigation had significant effects on moisture percentage of soil. The highest moisture percentage (14.20%) was obtained with three irrigations and the lowest one (8.00%) was obtained with no irrigation (Table 2). Moisture percentage of soil was significantly affected by the interaction of rate of flobond and irrigation treatment. Table 3 shows that the highest moisture percentage (15.00%) was obtained with 8 g flobond pot⁻¹ under three irrigations and the lowest one (8.89%) was obtained in no flobond and no irrigation.

Table 3. Effect of interaction of flobond and level of irrigation on yield dimensions of wheat cv. Sourov

Interaction (rate of flobond × Level of Irrigation)	Straw yield (t ha ⁻¹)	Biological yield (t ha ⁻¹)	Harvest index (%)	Moisture content of soil (%)
F ₁ I ₀	3.10i	4.47l	30.64k	8.89k
F ₁ I ₁	3.19i	5.06k	36.79e-h	10.20j
F ₁ I ₂	4.00gh	7.01h-h	42.96ab	13.30c
F ₁ I ₃	4.05gh	7.10gh	42.95ab	13.15cd
F ₂ I ₀	3.87h	5.96j	35.02ghi	11.00i
F ₂ I ₁	3.97gh	6.35ij	37.57efg	11.20i
F ₂ I ₂	4.72de	7.87de	40.25a-d	12.00gh
F ₂ I ₃	4.70de	7.82de	39.88b-e	13.35c
F ₃ I ₀	3.11i	4.54l	31.36jk	10.00j
F ₃ I ₁	3.97gh	6.31ij	37.11e-h	12.40efg
F ₃ I ₂	4.84cd	8.20cd	41.00a-d	12.80de
F ₃ I ₃	4.00gh	7.01h	42.96ab	14.00b
F ₄ I ₀	5.14bc	7.63ef	32.67ijk	10.00j
F ₄ I ₁	4.63de	7.52efg	38.47def	12.00gh
F ₄ I ₂	4.58def	8.16cd	43.85a	12.50ef
F ₄ I ₃	5.63a	8.94ab	37.01e-h	14.10b
F ₅ I ₀	4.95bcd	7.09gh	30.18k	11.90h
F ₅ I ₁	5.74a	8.67ab	33.79ij	12.20fgh
F ₅ I ₂	5.75a	9.21 a	37.52efg	12.50ef
F ₆ I ₃	5.25b	8.55bc	38.68c-f	13.35c
F ₆ I ₀	4.23fgh	6.43i	34.24hij	12.10fgh
F ₆ I ₁	4.20fgh	7.21fgh	41.70abc	12.50ef
F ₆ I ₂	4.73de	8.26cd	42.67ab	12.70de
F ₆ I ₃	5.64a	8.76ab	35.66f-i	15.00a
S \bar{x}	0.13	0.15	0.98	0.15
Level of significance	0.01	0.01	0.05	0.01

NS = Not significant.

In a column figures with same letter or without letter do not differ significantly whereas figures with dissimilar letters differ significantly as adjudged by DMRT

Conclusion

The findings of the experiment indicate that flobond a chemical water retainer had remarkable positive effects on the growth, development and productivity of wheat cv. Sourov. The post harvest soil analysis indicates that moisture content of soil was higher with highest level of water retainer treated pots.

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