

GRAIN YIELD AND PROTEIN CONTENT OF WHEAT AS AFFECTED BY CYTOZYME APPLICATION AT VARIOUS GROWTH STAGES

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The effect of two products of cytozyme viz. dry seed⁺ and crop⁺ was studied on the growth, yield and protein contents of wheat variety LU 26. Dry seed was applied to the seed at the rate of 10 gms/kg seed whereas crop⁺ was sprayed at different growth stages of the crop at the rate of 450 ml/hectare. Both the dry seed⁺ and crop⁺ treatments increased the grain yield significantly over control. However, dry seed⁺ appeared to be better than crop⁺ and resulted in an increase of 15.5 per cent in grain yield over control by improving the number of productive heads per unit area, spike length, awnlets per spike and 1000 grain weight, whereas crop⁺ application at boot stage tended to increase the protein content of the grain.

INTRODUCTION

Although a lot of research work has been done to increase wheat production by evolving high yielding varieties and using improved agronomic practices, the introduction of plant growth regulating substances has opened a new avenue for boosting agricultural production. Cytozyme is a recently introduced plant growth substance manufactured by Statex Industries of USA for commercial use in agriculture. Various cytozyme products such as dry seed⁺ and crop⁺ have been introduced in the market for treating the seed and standing crop respectively. These are biologically derived products which augment nutritional support for plants and contain various enzyme-co-factors acting the change enzyme structure in the plant in a way that enhances metabolic activities. It also provides aminoacids and chelating minerals essential to plant growth.

The preliminary research work done on the use of cytozyme indicates that it enhances the yield of many agricultural crops notably wheat, rice and maize[1]. Application of different growth regulators has been reported to modify the development of various economically valuable plant characters like tillering and grain development[2,3,4]. On the other hand Haque *et al.* [5] and Lukyaivyuk *et al.* [6] stated that there was a substantial increase in the number of grains per ear and grain weight when wheat seed was treated with chloromequat before sowing. Keeping these in view this study was undertaken to evaluate the effect of two newly introduced cytozyme products, dry seed⁺ and crop⁺ on wheat yield and its quality under irrigated conditions at Faisalabad.

MATERIALS AND METHODS

This piece of research work was conducted at the University of Agriculture, Faisalabad during the year 1979-80. A commercial wheat variety LU 26 was used as a test crop. The crop was sown on November 20, 1979 on a well prepared seed-bed with a single row hand drill in rows 22.5 cm apart. The experimental treatments comprised of control, dry seed⁺, crop⁺ at tillering, crop⁺ at booting, crop⁺ at tillering and booting, dry seed⁺ + crop⁺ at tillering, dry seed⁺ + crop⁺ at booting and dry seed⁺ + crop⁺ at tillering and booting stages.

The experiment was quadruplicated in randomized complete block design. The net plot measured 2.70x 5.48 m. The crop was fertilized with 112 kg N and 56 kg P₂O₅/ha in the form of urea and single super phosphate respectively. The whole of the phosphorus alongwith half of the nitrogen was applied at sowing while the remaining nitrogen was applied with first irrigation. The seed treatment was done by dusting the power of dry seed⁺ on the moist seed at the rate of 10 gm per kg seed and then seed was thoroughly mixed to ensure the firm sticking of the product to the seed, while foliar application of crop⁺ was done by spraying 1 per cent solution of crop⁺ in water at the rate of 450 ml per hectare at various growth stages as mentioned above. In all three irrigations were given to the crop in addition to the natural precipitation of 72.6 mm received during the growin period of the crop. A representative area of 90 x 60 cm was harvested separately in each plot to collect data on different plant characters. The crop was harvested in the first week of May, 1980. Nitrogen per-

centage was determined by Gunning and Hibbards method of sulphuric acid digestion as prescribed by Jackson [7] and crude protein percentage was calculated by multiplying the nitrogen percentage with 6.25. The data obtained were statistically analysed by using the analysis of variance method and differences among the treatment means were compared by the Duncan's Multiple Range Test at 5 per cent probability [8].

RESULTS AND DISCUSSION

The data pertaining to the yield parameters as affected by the different cytozyme treatments are presented in Table - 1.

It is evident from the table that all the treated plants produced a significantly higher number of productive heads per unit area than the check. However, the differences among the treated plots were statistically non significant. The highest number of 314 productive heads per unit area was recorded in case of dry seed⁺. The results are similar to those obtained by Singh *et al.* [2], who reported that Gibberellic acid application at concentrations ranging from 50-300 ppm enhanced the productivity tillering in wheat.

As regards spike length, all the treatments except

crop⁺ at tillering and booting and crop⁺ at tillering produced significantly longer spikes than the control. The results further indicated that treatments having dry seed⁺ in common tended to increase spike length over crop⁺ treatments including the control. However, the effects were more pronounced when combined dry seed⁺ and crop⁺ was used at reproductive stage rather than at vegetative stage. Increase in spike length from 9.5 to 10.6 cm with the application of a growth regulator (Mendok)* was also reported by Mohan Ram and Rustagi [3]. The results are further supported by Pavlov and Khristov [4].

The data on number of spikelets/spike showed highly significant difference among the treatment. All the treated plots produced significantly greater number of spikelets per spike than the control. The maximum number of 21.9 spikelets per spike was recorded in dry seed⁺ treatment as against the minimum of 20.7 spikelets per spike in check plots. These results are in line with [1] who noted about 43.7 per cent increase in the number of spikelets per spike with the application of cytozyme.

Similarly the differences among the various treatments with respect to the number of grains per spike were significant. The highest number of 48.1 grains per spike was produced by the plants treated with dry seed⁺ and was

Table 1. Effect of cytozyme application at various growth stages on the yield, yield components and protein content of wheat.

Treatments	Productive head per unit area (90 x 60 cm)	Spike length (cm)	Spikelets per spike	Grains per spike	1000-grain weight (gm)	Grain yield tonnes/ha	Protein content in grain (%)
1. Control	273 b	13.0 c	20.7 c	40.8 c	49.6 d	3.66 c	11.7
2. Dry seed ⁺	314 a	14.0 a	21.9 a	48.1 a	51.7 a	4.23 a	11.9
3. Crop ⁺ at tillering	297 a	13.3 bc	21.1 bc	45.9 ab	51.0 bc	4.00 b	11.5
4. Crop ⁺ at booting	299 a	13.8 ab	21.5 ab	47.0 ab	51.0 bc	3.96 b	12.7
5. Crop ⁺ at tillering and booting	305 a	13.6 abc	21.2 b	47.2 ab	50.8 bc	3.88 b	12.6
6. Dry seed ⁺ + crop ⁺ at tillering	305 a	13.8 ab	21.4 ab	42.9 bc	51.0 bc	3.89 b	12.5
7. Dry seed ⁺ + crop ⁺ at booting	294 a	14.0 a	21.3 b	47.5 ab	50.8 c	3.86 b	12.6
8. Dry seed ⁺ + crop ⁺ at tillering and booting	301 a	14.0 a	21.3 b	45.6 ab	51.3 ab	3.97 b	12.0
S.E.	6.08	0.21	0.16	1.50	0.15	.05	N.S.

Treatment means having the letter in common do not differ significantly. *Haas Co., Philadelphia USA
Duncan's Multiple Range Test at 5% probability. Dry Seed⁺ Crop⁺ Cytozyme products of Statex Industries of USA

significantly superior to dry seed⁺ + crop⁺ at tillering including control but was statistically at par with rest of the treatments. The results are in agreement with [1] who reported 2.3 per cent increase in the number of grains per cob in maize by the application of various cytozyme products.

The data pertaining to 1000-grain weight indicated highly significant differences among the various treatments under study. All the treated plots produced considerably heavier grains than check plots. However, amongst the treated plots, dry seed⁺ treatment gave significantly more 1000-grain weight than the rest of the treatments except the treatment of dry seed⁺ + crop⁺ at tillering and booting stages. It may be concluded from the results that propionate of dry seed⁺ alone or in combination with crop⁺ at tillering and booting appeared to be the more appropriate treatment in respect of this character. Reasonable increase in grain number and grain weight with the application of Tur,** a growth regulating substance, was also observed by Lukyaivyuk *et al.* [6].

The results for grain yield as influenced by the cytozyme application indicated highly significant differences among the various treatments under study. The highest grain yield of 4.23 tonnes per hectare was recorded in dry seed⁺ treatment and appeared to be significantly superior to rest of the treatments, which in turn were statistically at par with one another except control that produced 3.66 tonnes grain yield per hectare. The highest grain yield in the case of dry seed⁺ treatment was attributed to a relatively increased number of productive heads per unit area, a greater number of grains per spike and a greater 1000-grain weight. The results further indicated that the growth regulating effect of cytozyme application appeared to be more pronounced when it was applied as dry seed⁺ rather than as foliar application (crop⁺). However, it was interesting to note that combined application of dry seed⁺ and crop⁺

at different growth stages failed to show comparable effects on grain yield, possibly because the effect of crop⁺ was not additive. These results are in accordance with the findings of [1] who reported 15.7 per cent increase in wheat yield by cytozyme application. Similarly increase in grain yield by the application of various growth regulators was also reported by Ibrahim *et al.* [9] and Haque *et al.* [5].

Regarding the protein content in grain, there was appreciable increase in protein content over that of the control by application of cytozyme especially crop⁺ at the boot stage, but the differences were not large enough to reach the level of significance. Similarly increase in protein contents in wheat with the application of CCC** was also reported by Sharaky [10].

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