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INTERACTIVE EFFECT OF NITROGEN AND WATER STRESS ON NITROGEN CONTENT AND GRAIN YIELD OF TWO WHEAT (*Triticum aestivum* L.) VARIETIES

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The interactive effect of nitrogen and water stress on nitrogen content and grain yield of two wheat varieties (Inqalab-91 and. Parwaz-94) was investigated. Urea as nitrogen fertilizer was applied before the imposition of water stress, whereas water stress was imposed 25, 35 and 45 days after germination. The data revealed that sporadic stress and urea fertilizer showed highly significant response. Nitrogen at higher rates effectively balanced the adverse effect of water stress .

Key words: grain yield, interactive effect, nitrogen contents, water stress, wheat varieties

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In Pakistan, one-third of wheat cultivation is onrainfedarea where the crop often suffers from severe moisture stress. Much of the remaining area which is canal irrigated also encounters drought especially at critical stages of plant development such as tillering and grain filling, thus reducing the overall yield (Anonymous, 1996-97). According to Yadaiv (1991) increasing water supply from 0.4 to 0.8 (IW:CPE) increased yield from 2.97 to 3.8 t ha'. HoImes (1981) reported that split application of nitrogen gave higher yield than single application. Grain nitrogen content was increased with increasing nitrogen rate. Barak (1981) stated that above ground parts, roots, dry matter and N content were increased with application of nitrogen at enhanced rate. Lakhy (1988) reported that nitrogen application in wheat increased number of productive ears, grain yield and grain protein content. Fischer et al. (1993) studied the interactive effect of nitrogen fertilizer and irrigation on grain yield and protein content of spring wheat. They found that grain yield response to N applied at. seedling stage was very high and grain protein content increased only with N application after the initiation of stem elongation. Khan et aI. (1994) observed the response of wheat to different water and N regimes and found that N application up to 102 kg ha' increased yield significantly. Interactive effect of water supply and nitrogen fertilization was also significant. Flink et aI. (1996) observed that an increase in the availability of N and water enhanced. total biomass production, grain yield and leaf area. The present study was planned to evaluate the interactive effect of N and drought stress on N content and grain yield of two wheat varieties Inqalab-91 and Parwaz-94.

MATERIALS AND METHODS

The experiment was conducted- at the University of Agriculture, Faisalabad during 1997. The seed of the two varieties was obtained from the Department of Agronomy. Urea was applied as nitrogen fertilizer. The experiment was laid out in a split plot design with three replications having seven treatments including control and a gross experimental plot measuring 27M x 30m. Water stress was imposed 25,35 and 45 days after germination. The entire experimental area was divided into two main plots for the two varieties. Each main plot was further divided into three subplots, and each subplot having an area of 1.5m x 2.4m had seven treatments. The N content of wheat grains was determined by micro Kjeldhal method.

Treatments: The treatment combinations comprised To, (Control); T_1 N 49 g/subplot and water stress after 25 days; T_2' N 49g/subplot and water stress after 35 days; T_3, N 49g/subplot and water stress after 45 days; T_4, N 98g/subplot and water stress after 25 days; T_5' N 98glsubplot and water stress after 35 days; T_6, N 98glsubplot and water stress after 45 days. The data regarding N contents and grain yield were analyzed and treatment means were compared using LSD test at p = 0.05 (Steel and Torrie, 1984).

RESULTS AND DISCUSSION

The data revealed that different treatments significantly reduced N percentage in wheat grain. Maximum N percentage was recorded in control (To), while minimum was observed in T_1 where plants were subjected to water stress during earlier growth and received half dose of nitrogen. Treatments T", T_4 and T_3 differed non-significantly from one another but were significantly different from rest of the treatments and control. Similarly, non-significant difference was found between T_3 and T_6.

Both the varieties did not differ significantly. However, N percentage was comparatively more in VI (Inqalab-91) than V_2 (Parwaz-94). Interaction between varieties and treatments was also non-significant. It means that the two varieties showed similar response to different ,treatments in respect of morphological parameters and yield components. Nitrogen content of grain was severely affected

at earlier growth stages. Full nitrogen application increased N percentage significantly. However, still the value was lower than that of the control.

Data presented in Table 2 revealed that different treatments significantly decreased grain yield. Maximum grain yield! plant was recorded in To where water supply and N were optimally provided. The minimum yield as recorded in T ı differed significantly from all the remaining treatments and control. Treatments *Tb* and T! differed significantly from T ı and rest of the treatments including control. Minimum decrease in grain yield per plant was noted in T, where water stress was imposed 35 days after germination and given full dose of N. The two varieties differed non-significantly from each other, However, variety V! tended to yield Iriore than V r Varieties interaction with treatments was also non-significant which mdrcated that the two varieties showed a similar response to different treatments. Thus it may be stated that decrease in yield due to water stress imposed 25 or 35 days after germination coupled with use of N at low rates was compensated significantly by providing N at increased rates. Similar results were reported by Hatifield et a1. (1988) and Rathore are Patel *0991).*

Table 1. Percentage of N in wheat grains of two varieties as affected by water stress and nitrogen application

Varieties		Means
VI	Inqalab-91	1,696 NS
V!	parwaz-94	1.642NS

Treatments	Means	S,E.
To	1.824 a	±1,87
T_5	1.567 b	±1,47
T_4	1,472 a	±1,37
T,	1.382 a	±1,29
Tb	1.293 a	±1,19
T!	1.193 a	±1,17
T,	1.053 a	±1,07

Any two means having the same letter are statistically non-significant; NS = Non-significant.

Table 2. Grain yield per plant of two wheat varieties as affected by water stress and nitrogen application.

Varieties		Means
VI	Inqalab-91	4.652NS
V!	parwaz-94	4.838NS

Treatments	Means	S,E.
To	9.51a	±2.70
T.,	8.33 b	±2.70
T_4	6.01 c	±1,76
T_3	5,46 d	±1,53
T_6	4.62 e	±1,43 (
T_2	3.52 e	±1,33
T_1	2.56 f	±1,23

Any two means having the same letter are non-significantly different; NS = Non-significant.

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