Research Article

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Ekin
Journal of Crop Breeding and Genetics

3(2):79-81, 2017

Ekin International biannual peer-reviewed journal

Genotypic Variability in Triticale (*Triticale hexaploide* Lart.) for Response of Azotobacter Inoculation in Semi Arid Conditions

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Citation:
Singh A.P., Srivastava V.K., Behl R.K., Bishnoi O.P., 2017. Genotypic Variability in Triticale (*Triticale hexaploide* Lart.) for Response of Azotobacter Inoculation in Semi Arid Conditions. Ekin J. 3(1):79-81.

Received: 10.02.2017 ***Accepted: 15.05.2017*** ***Published Online: 29.07.2017*** ***Printed: 31.07.2017***

ABSTRACT

Triticale hexaploide Lart. commonly known as Triticale is a manmade cereal obtained from cross between wheat (*Triticum*) and rye (*Secale*). It is used for food and feed purposes in view of its high nutritive value. In the present study, we focused on enhancement in the crop production of Triticale (*Triticale hexaploide* Lart.) under semi arid conditions at Agra, India. A pot experiment was conducted to evaluate the effect of *Azotobacter* and chemical fertilizers on seven variety of triticale *viz.* R2TL3001, R1TL3005, R1TL3006, R1TL2942, R2TL3002, R1TL3003, R1TL3004 and a local variety of wheat which was treated as check. The results of R1TL2942, R1TL3003 and R1TL3006 with *Azotobacter* were observed as best yielding variety of Triticale with 56-59 grains and with 55-58 grains per spike respectively. The findings show that R1TL2942, R1TL3003 and R1TL3006 are the potential variety of Triticale that could grow under Indian climatic conditions.

Keywords: Triticale, wheat, Azotobacter.

Introduction

Triticale (*Triticale hexaploide* Lart.) is a hybrid cereal of wheat (*Triticum*) and rye (*Secale*) which was developed by using conventional plant breeding followed by embryo culture. Its origins could be traced back to the Scotland (Ammar. *et al*., 2004). The research work on triticale was started in 1950's in Canada and the first Triticale variety was release in 1972 by University of Manitoba. Triticale was developed to integrate the grain qualities of wheat with less input requirements along with the hardiness of rye. However, it has had limited take-up in the India till date while triticale has made a significant impact in Europe, notably in Poland, Hungary, Germany where over 4 million hectares are grown with good performance. It becomes an accepted crop worldwide, competitive with local grains. The triticale varieties are equal or higher yielding in comparison of other crops for grain, forage and biomass production, for feed and food along with industrial applications. It has superior adaptation under stress conditions like wise drought, acidic soils, excess moisture and situations of high fertility where other crops yield less and are poorly adapted. The grain of triticale is much suitable as feed for ruminants and monogastrics, especially for silage and swine feed. Triticale develop a new levels of sustainable flexibility for crop planning, especially for enabling year-long forage supplies using grazing or conserved forage. Triticale could also play a special role in integrated cropping systems which provide the crop diversity in the rotation, a break in pest, disease and weed cycles, and seasonal flexibility. At the same time, high yields of triticale silage or grain will returned to the livestock operation that generated the manure *(*Chapman *et al.,* 2005*).* This is well known that micro-organisms play an important role in number of chemical transformations in soils and influenced the availability of major nutrients like nitrogen, phosphorus, potassium and sulphur to the plants. Thus, the application of chemical fertilizer may be reduced by 20-50% with the use of bio-fertilizers (Balyan, 1998). Azospirillum, Azotobacter, Blue green algae (BGA), VAM and Phosphate Solubilizing Bacteria (PSB) can be used as bio-fertilizers to increase the crop production (Singh, *et al*., 2006). Therefore the present was planned to evaluate the response of Triticale genotypes to inoculation with Azotobacter.

Materials and Methods

Investigation was carried out during Rabi season of 2016-17 in the research plots of the Department of Biotechnology, Raja Balwant Singh Engineering Technical Campus, Bichpuri, Agra. A pot experiment was conducted to evaluate the effect of Azotobacter and chemical fertilizer on seven variety of triticale namely R2TL3001, R1TL3005, R1TL3006, R1TL2942, R2TL3002, R1TL3003, R1TL3004 and a local variety of wheat kept as check. All the experiments performed in this study were replicated three times in a randomized block design. There are four plant replicates in all of fourty eight pots. The soil of the experimental field was sandy loan in texture with a pH 7.84 the soil was low in available nitrogen (174.40 kg ha^{-1}), medium in available phosphorus (25.80 kg P_2O_5 ha^{-1}) and rich in available potash (220.70 kg K_2O ha^{-1}). The Triticale and wheat varieties were sown during Rabi season on January 04, 2017. The culture solution was prepared in the concentration of 100 g/l of Azotobacter, in 10% jaggory solution and mixed with the fine and dry soil before sowing. The recommended dose of NPK in the ratio of 120:60:60 kg/ha was applied as per treatment in the form of urea, single super phosphate and potash. One-third amount of urea and full dose of single super phosphate and potash were used and mixed thoroughly. Remaining two third of urea was top-dressed in two split doses. The cultural operations viz. irrigation, weed control, earthing up, insect pest control etc. were done in each of the pots uniformly throughout the course of investigation whenever necessary. The parameters for the experimental setup includes the date of germination, initiation of first flag leaf, initiation of spike, plant height, number of spikes, number of spikelets/spike, number of grains per spike along with the test weight.

Results and Discussion

All of the studied triticale varieties germinated between 13-15 January 2017. The dates for the initiation of first flag leaf ranged between 16-25 February 2017 while the initiation of spikes started from 28 February 2017 to 10 March 2017. In some cases (R1TL3002 and R1TL3004) the initiation of spikes was observed upto 20 March, 2017. The maximum number of spikelet of 55±0.66 per plant was investigated in R1TL2942 treated with Azotobacter followed by R1TL3006 and R1TL3003 with the number of spikelet of 53±2.08 and 51±4.25 respectively. The per plant yield (g/plant) of R1TL2942, R1TL3006 and R1TL3003 treated with Azotobacter was observed as 52±0.63, 51±2.50 and 49±4.58 respectively. These findings are encouraging as the yield of control crop was observed as 25±0.69. The data on various plant parameters are given in Figure 1. Other varieties of triticale were not very much promising with respect to plant yield. The results of the experiments in which the triticale seeds were grown under chemical fertilizers are summarized in Figure 2. With the chemical fertilizer treatment all the seven varieties of triticale were observed as plant yield between 19±2.08 to 23±0.62 which is less or nearby the check. With the above discussion it is clear that the *Azotobacter* inoculums may be used as a biofertilizer for the triticale and it may reduce the use of chemical fertilizers and save the environment. The Azotobacter may be used as a component of nutrient supply system for the sustainable agriculture. The finding were also supported by the findings of Kader *et al.,* 2002 in which they studied the effect of *Azotobacter* inoculums on wheat and found that it reduces the use of urea N by 20 percent.

Figure 1. Effect of Azotobacter on investigated varieties of triticale

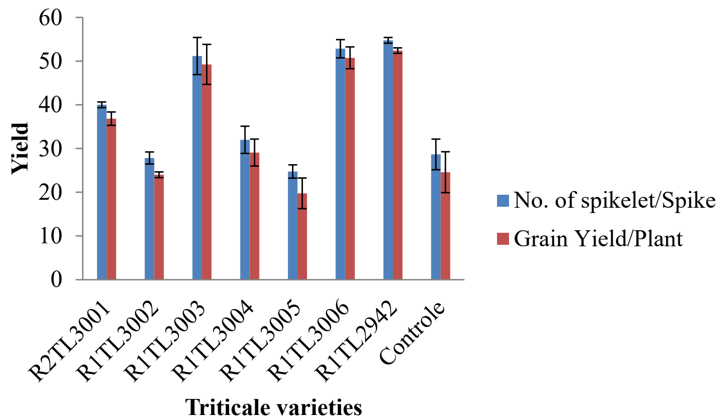
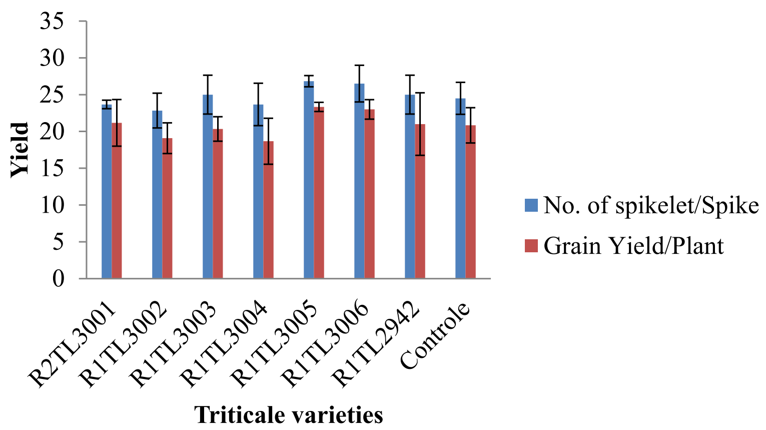


Figure 2. Effect of chemical fertilizer on investigated varieties of triticale



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Additional Suggested Readings

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