International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2019; 7(6): 1129-1131

Received: 25-09-2019
Accepted: 27-10-2019

Mohammed Mohsin
Ph.D. Scholar, Department of Agronomy, Rajasthan College of Agriculture, Udaipur, Rajasthan, India

J Choudhary
Assistant Professor, Department of Agronomy, Rajasthan College of Agriculture, Udaipur, Rajasthan, India

Mohan Lal Jat
Ph.D. Scholar, Department of Agronomy, Rajasthan College of Agriculture, Udaipur, Rajasthan, India

Satya Narayan Meena
Ph.D. Scholar, Department of Agronomy, Rajasthan College of Agriculture, Udaipur, Rajasthan, India

Corresponding Author:
Mohammed Mohsin
Ph.D. Scholar, Department of Agronomy, Rajasthan College of Agriculture, Udaipur, Rajasthan, India

Effect of sowing environments and foliar spray of agro-chemicals on quality and biochemical changes of wheat (*Triticum aestivum* L.)

Mohammed Mohsin, J Choudhary, Mohan Lal Jat and Satya Narayan Meena

Abstract
A field experiment was carried out at Instructional Farm, Department of Agronomy, Rajasthan College of Agriculture, MPUAT, Udaipur during *rabi* 2017-18 and 2018-19 to study the effect of sowing environments and foliar sprat of agro-chemicals. The experiment was laid out in split-plot design with four replications involving four sowing environments *viz,* D_1- 15th November, D_2- 30th November, D_3- 15th December and D_4- 30th December as main plots and five agro-chemicals as sub plots *viz,* A_1- water spray, A_2- KCl 0.1%, A_3- KCl 0.2%, A_4- Salicylic acid 100 ppm and A_5- Salicylic acid 200 ppm. Results showed that among different sowing environments, crop sown under 15th November recorded the significantly higher protein content. Among agro-chemicals, foliar spray of salicylic acid 100 ppm recorded the significantly higher protein content over rest of agro-chemicals treatments. 30th December sown registered the highest proline content which was significantly superior over rest of sowing environments. However, foliar sprays of agro-chemicals fail to produce any significant effect on proline content of wheat leaves.

Keywords: Salicylic acid, KCl, protein content and proline content

Introduction

Wheat (*Triticum aestivum* L.) is the World's most important widely cultivated food crop. The sowing time plays an important role among various agronomic factors, which influencing the quality and yield of wheat. The production of wheat grain in the year 2018-19 was 101.20 m t from acreage of 29.55 m ha at a yield level of 3424 kg ha^{-1} whereas in Rajasthan it is grown on 2.88 m ha area with production of 9.60 m t and the productivity of 3374 kg ha^{-1} (Progress report, AICRP on Wheat and Barley, 2018-19). To keep pace with increasing population, India needs to increase wheat production. However, climate change is one of the important factor responsible for low yield in wheat. Its time of sowing is one of the most important factors that govern the crop phenological development and efficient conversion of biomass into economic yield. The green revolution is mainly due to introduction of high yielding varieties. There is no more land under cultivation and hence it is necessary to employ low cost technologies for improving wheat yield through natural resource management. Delay in the sowing of wheat crop causes the substantial loss in grain yield due to high temperature at later phenological stages (maturity). Delayed germination due to low soil and ambient temperature prevailing at the time of late sowing and short vegetative period of the crops are the main causes of low yield under late sown condition. If wheat is sown late, the crop is induced to flower quite early due to onset of spring season cutting vegetative phase short which result in shortening of source and sink capacity. Plant's tolerance against environmental stresses can be increased by the exogenous application of certain growth enhancers like proline, amino acids, ABA, glycine betaine, BAP, silicon, soluble sugars, humic acid and potassium (Farooq *et al.*, 2009) [3]. Keeping in view the above facts, the present study was planned to evaluate the performance of wheat under different sowing environments and agro-chemical treatments.

Materials and methods

Field experiments were conducted during *rabi* seasons of 2017-18 and 2018-19 at the Agronomy Instructional Farm, Rajasthan College of Agriculture, Udaipur (Rajasthan). The soil of experimental field was clay loam in texture and slightly alkaline in reaction (pH 8.2 and 8.1).

The soil was medium in available nitrogen (283 and 278 kg ha^{-1}) and phosphorus (19.65 and 20.12 kg ha^{-1}), high in available potassium (321.7 and 324.5 kg ha^{-1}) during *rabi* season of 2017-18 and 2018-19. The field experiment comprising of twenty treatment combinations *viz.* four sowing environments D_1: 15th November, D_2: 30th November, D_3: 15th December, D_4: 30th December as main plots and five agro-chemicals *viz.* A_1: water spray, A_2: KCl 0.1%, A_3: KCl 0.2%, A_4: salicylic acid 100 ppm, A_5: salicylic acid 200 ppm as sub plot treatments was laid out in split plot design with four replications. Two foliar sprays of agro-chemicals were applied at 50 and 70 DAS. Sowing of wheat variety Raj. 4079 was done by using seed rates of 100 kg ha^{-1} at inter row spacing of 22.5 cm. Recommended dose of N, P_2O_5 and K_2O for wheat in Udaipur region is 120, 80 and 60 kg ha^{-1}, respectively. Full dose of phosphorous, potassium and one third dose of nitrogen were applied as basal. Remaining dose of nitrogen splited twice (in two equal parts) and top dressed at the time of second and third irrigation. Recommended package of practices was followed for all other operations. Estimation of grain protein of wheat was done as per the method developed by Lowery *et al.* (1951) [7]. Biochemical parameter like free proline was determined from the fresh leaves at 75 DAS according to the method of Bates *et al.* (1973) [2]. All the experimental data for protein content and proline content were statistically analyzed by the method of analysis of variance (ANOVA) as described by Panse and Sukhatme (1985) [9].

Results and discussion

The results reveals that grain protein content was significantly affected under altered sowing environments during both the years as well as on pooled basis Protein content decreased gradually with delayed sowing and was maximum in first sowing date (D_1) and minimum in last sowing date (D_4). The favourable growing condition during timely sown crop induces more of an increase in nitrogen accumulation than in dry matter leading to higher protein content. Similar results have been reported earlier by Jat *et al.* (2013) [4] and Man *et al.* (2013) [8]. Foliar spray of A_2 (KCl 0.1%), A_3 (KCl 0.2%), A_4 (salicylic acid 100 ppm) and A_5 (salicylic acid 200 ppm) significantly increase the grain protein content during 2017-18 and 2018-19 over A_1 (water spray). The maximum increase in protein content was recorded with A_4 (salicylic acid 100 ppm) but it was statistically at par with A_5 (salicylic acid 200 ppm). This increase in protein content might be outcome of increased concentration of nitrogen in grain of wheat by foliar application of agro-chemicals which promote protein synthesis, which is in accordance with the Kousar *et al.* (2018) [5] and Sofy (2015) [12].

D_4 (30th December) sown crop recorded the significantly higher proline content at 70 DAS as compared to D_1 (15th November), D_2 (30th November) and D_3 (15th December) sowing environments. It has been shown that accumulation of proline is a common response to a wide range of biotic and abiotic stress such as a high temperature (Kumar *et al.*, 2012) [6]. The results of present research showed that increasing temperature under late sown led to increase of proline content of plants. Bala and Sikder (2018) [1] and Roy *et al.* (2013) [11] also reported higher proline production with delay in sowing date beyond optimum time. However, Different treatments of agro-chemicals failed to cause significant variation in proline content during both the years of experimentation.

Table 1: Effect of sowing environments and foliar spray of agro-chemicals on grain protein content and proline content of wheat leaves

Treatments	Protein content (%)			Proline content (μmoles g^{-1})		
	2017-18	2018-19	Pooled	2017-18	2018-19	Pooled
Sowing environments						
D_1 : 15th November	12.25	12.37	12.31	1.652	1.636	1.644
D_2 : 30th November	11.29	11.49	11.39	1.670	1.651	1.661
D_3 : 15th December	10.72	10.82	10.77	1.763	1.755	1.759
D_4 : 30th December	10.26	10.49	10.38	1.860	1.841	1.850
SEm.±	0.09	0.11	0.05	0.02	0.02	0.01
CD (P= 0.05)	0.29	0.35	0.15	0.05	0.06	0.03
Agro-chemicals						
A_1 : Water	10.56	10.67	10.62	1.728	1.713	1.720
A_2 : KCl 0.1%	11.06	11.20	11.13	1.731	1.718	1.724
A_3 : KCl 0.2%	11.09	11.25	11.17	1.733	1.718	1.726
A_4 : Salicylic acid 100 ppm	11.51	11.73	11.62	1.743	1.730	1.737
A_5 : Salicylic acid 200 ppm	11.41	11.62	11.51	1.748	1.725	1.736
SEm.±	0.10	0.11	0.05	0.02	0.02	0.01
CD (P= 0.05)	0.29	0.31	0.14	NS	NS	NS

Conclusion

Based on two years experimentation it concluded that 15th November sown crop recorded the significantly higher grain protein content over rest of sowing dates. Among agro-chemical treatments, foliar spray of salicylic acid 100 ppm at 50 and 70 DAS recorded the highest protein content. 30th December sown crop recorded the proline content at 75 DAS due to increasing temperature under late sown condition. While, agro-chemicals did not cause significant effect on proline content of wheat leaves.

References

1. Bala P, Sikdar S. Impact of post-anthesis heat stress on physiological and biochemical traits of wheat genotypes. Journal of Stress Physiology and Biochemistry. 2018; 14(3):27-37.
2. Bates LS, Waldren RP, Teare ID. Rapid determination of free proline for water stress studies. Plant and Soil. 1973; 39(1):205-207.
3. Farooq M, Wahid A, Kobayashi N, Fujita D, Basra SMA. Plant drought stress: effects, mechanisms and management. Agronomy for Sustainable Development. 2009; 29(1):185-212.
4. Jat LK, Singh SK, Latare AM, Singh RS, Patel CB. Effect of dates of sowing and fertilizer on growth and yield of wheat (*Triticum aestivum*) in an Inceptisol of Varanasi. Indian Journal of Agronomy. 2013; 58(4):611-614.

5. Kousar R, Qureshi R, Jalaluddin, Munir M, Shabbir G. Salicylic acid mediated heat stress tolerance in selected bread wheat genotypes of Pakistan. Pakistan Journal of Botany. 2018; 50(6):2141-2146.
6. Kumar S, Gupta D, Nayyar H. Comparative response of maize and rice genotypes to heat stress: status of oxidative stress and antioxidants. *Acta Physiologiae Plantarum.* 2012; 34(1):75-86.
7. Lowery OH, Rosebrough NJ, Farr AL, Randar RJ. Protein measurement with the folin phenol reagent. Journal of Biological Chemistry. 1951; 193(3):265-275.
8. Man MK, Dodia IN, Choudhary KM. Response of bread wheat (*Triticum aestivum* L.) and durum wheat (*Triticum durum* Desf.) genotypes to different sowing time on quality, nutrient uptake and economics in North Gujarat Agro-climatic conditions. International Journal of Agricultural Sciences. 2013; 9(2):681-684.
9. Panse VG, Sukhatme PV. Statistical methods for agricultural works. ICAR, New Delhi, 1985.
10. Progress report, AICRP on Wheat and Barley. Improved technologies for higher income of farmers. Indian Institute of Wheat and Barley Research, Karnal, 2017-18, 02.
11. Roy TK, Hafiz MHR, Islam MR, Hasan MA, Siddiqui MN. Late planting heat stress on ear growth physiology of wheat. International Journal of Biosciences. 2013; 3(11):8-19.
12. Sofy MR. Application of salicylic acid and zinc improves wheat yield through physiological processes under different levels of irrigation intervals. International Journal of Plant Research. 2015; 5(5):136-156.