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RESEARCHARTICLE

Effect of harvesting dates on the yield and quality attributes of the wheat cultivars

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ABSTRACT

Harvesting is the important parameter both for the researchers and the farmers. The harvesting of the crop should be done at the optimum time. The early, as well as the late harvest of the crop both, will lead to an irrecoverable loss in the yield of the crop. Many studies have been done on the harvesting of the wheat crop. It is the common practice in the case of wheat crop that the farmer will use the same seed again and again over the years, sometimes due non availability of resources the harvesting is delayed and to check the effect of harvesting dates an experiment was done in which the crop was harvested continuously for four days to find the effect of harvesting on the yield and its related attributes. Germination was less than the normal but was not having any significant difference. The germination percent of HD 3086 T_1 (first harvesting) was 95.33% while T_4 (Fourth harvesting) was 94.33%, whilst PBW 343 T_1 (94.66%) and T_4 (93.33%). The dry weight was showing best result for both varieties at first harvest HD30886 T_1 (0.22) and PBW 343 T_1 (0.15) as compare to the fourth harvest T_4 (0.18) and PBW 343 T_4 (0.11) respectively. The similar trend was followed for vigour index the highest vigour was of first harvest and lowest for the fourth harvest HD30886 T_1 (20.89) and PBW 343 T_1 (14.12) as compare to the fourth harvest T_4 (17.34) and PBW 343 T_4 (10.60).

Keywords: Agriculture, biotic, crops, density, economic, food

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INTRODUCTION

Wheat on the global level is among the vital cereal crops. A huge population worldwide rely on this crop.Talking about the numerical figure around 2 billion people consume wheat as staple food makes thirty-six percent across the globe. Wheat crop globally satisfies 55% need of carbohydrates along with twenty percent of the calories (Breiman and Graur, 1995). The 32% worldwide area is covered by wheat.

Wheat is the high-quality cereal inside the world, designated as the King of Cereals (Costa *et al.* 2013). Whereas wheat, the world's largest consumed grain (67 kg per year per person), is the third most widely used grain behind the maize and rice (FAO, 2010 and FAOSTAT, 2013), it is 647.4 million tons. In the modern world, the produce of the wheat has continuously increased with more arable soil as compared with the crop being grown there. The US, European Union, and Canada are the foremost wheat exporters across the globe, and Asia and Africa are the chief importers (FAO, 2010).

Due to the diversification in the agronomic and genetic compliance wheat can be efficiently grown in a wide variety of regions. The plant has good adaptability in the cooler areas as compared to tropical and semi-tropical regions. Wheat crop is in India ranks at the second position in the staple food as it is followed by rice. The main consumption areas of the country are the north and north-west. Every day millions of people depend upon wheat for a balanced diet as it is enriched with carbohydrates,

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vitamins, and protein. The wheat crop is basically milled down to make flour which is then used as a raw material for making the chapattis. The milled wheat is also used for making muffins, crumpets cereal bars, biscuits, and bread. The durum wheat is preferred to make spaghetti, pasta, and macaroni, whilst the soft wheat is used in cake pastries and cookies preparations. It also serves as a raw material for beverage industries which produce whiskey, beer as well as vodka.

Wheat crop and its cultivation in India have an ancient relation. The evidence from the site of Mohenjo-Daro state that wheat was grown 5000 years back. Post the independence the production yield per hectare was marginal. The production was 6.46 million tonnes and the productivity was 663 kg/ha. The conditions were such that the country needed to import the wheat to fulfil food requirement of the growing population.

Wheat in common tongue or in mother language is called Kanak or gehu and its family is Poaceae. As per the Indian conditions, the sowing of the wheat crop is done in the month of September till December and harvesting are done in the month of February to May which varies is due to different climatic conditions throughout the country. The harvesting of the wheat crop depends upon the climatic conditions as well as the date of sowing. The ideal temperature for the sowing of the wheat crop is 10 to 15 degree Celsius during the winters and summer temperature varies from 21 to 26 degree Celsius. At sowing time the temperature needed is slow while during the harvesting high temperature is required for proper ripening of the wheat crop. The production of wheat crop was 95.85, 86.52, 93.50 million tons in 2014, 2015 and 2016 respectively In India, whilst the area under the crop was 304.73, 314.65 and 302.27 lakh hectare and the yield in kg/ha was 3145, 2750 and 3093 (Department of Agriculture, Cooperation and Farmer Welfare Annual report 2016-2017). The trend in 2017-18 was 30.54 million hectare, production contributed to 94.57 million tons whilst the productivity was 3100 kg/ha. (Ramdas et al., 2019).

MATERIALS AND METHODS

Field study was carried out at Lovely Professional University farm during *Rabi* season 2017-2018. Fresh seeds of wheat (variety HD 3086 and PBW 343) were grown, taking 4 treatments with 3 replications for each treatment in a randomized block design (RBD). The harvesting was done on different days. The Four treatments include T_1 (First harvesting), T_2 (second harvest), T_3 (Third harvest), T_4 (Fourth harvest). The plot size was 9m × 2.3m with plant to plant and row to row distance of 60 and 20 cm, respectively. After that roll paper test was carried out inside the lab for further investigation in which germination percentage, seedling dry weight and vigour index were calculated.

Seed index stands for the weight of the 100 grains. The seed index was measured by counting the 100 seeds and then weighing them to get the result. The germination percentage we need the total number of seed kept for germination and the result of the germination test that is the total number of seeds which have been germinated. Only those seedling were taken into consideration which has a good growth of shoot and root. The seedling length was measured by summing up the root and shoot length from each of the replication. 100 seeds were selected and were analyzed for the germination percentage and later the seedling length was measured which help to evaluate the vigour index.

RESULTS AND DISCUSSION

Seed Index

The seed index of HD 3086 and PBW 343 has been depicted in table 1. The seed index of the first three treatment T_1 (3.80g), T_2 (3.76g), T_3 (3.73g) was at par with each other while there as a decline in the seed index on the fourth day of the harvesting T_4 (3.60g). The variety HD 3086 was showing no significant difference until the fourth day of the harvesting. The similar kind of the result was obtained in the variety PBW 343 the significant difference in the seed index was seen in the treatment T_4 (3.22g). While the result in the treatment T_1 (3.26g) T_2 (3.25g) and T_3 (3.24g) was at par with each other. The test weight of the variety

was similar to (Ali *et al.*, 2018). There are many factors which effect the seed index of the crop like rains before the harvesting of the crop, immature grains, incomplete filling of the grains and one of the reason is drying of the grains naturally in the field as per the (Laura, 2016). The rise in night temperature can be also a reason which can decrease the seed index (Lesjak and Calderini, 2017). The decline index in both the varieties was due to the natural drying of the crop due to a high temperature which prevailed after 25th of the April, an unusual upsurge in the temperature was noted (Corn newsletter, 2015).

Table 1: Effect of harvesting dates on the seed index (g) of the crop

Treatments	Seed Index (HD3086)	Seed Index (PBW 343)
T_1	3.80^a±0.05	3.26^a±0.00
T_2	3.76^a±0.03	3.25^a±0.00
T_3	3.73^a±0.00	3.24^a±0.00
T_4	3.60^b±0.00	3.22^b±0.00

Where, Data are in the form mean± SEM. Significance at P≤0.05 using SPSS ver. 22. T_1: First date of harvesting, T_2: Second date of harvesting, T_3: Third date of harvesting, T_4: Fourth date of harvesting.

Table 2: Effect of harvesting dates on the germination percentage

Treatments	Germination%(HD 3086)	Germination%(PBW 343)
T_1	95.33^a±0.33	95.00^a±0.57
T_2	95.00^a±0.00	94.00^a±0.57
T_3	94.66^a±0.33	93.66^a±0.88
T_4	94.33^a±0.33	93.00^a±1.15

Where, Data are in the form mean± SEM. Significance at P≤0.05 using SPSS ver. 22. T_1: First date of harvesting, T_2: Second date of harvesting, T_3: Third date of harvesting, T_4: Fourth date of harvesting

Germination percentage

The germination percentage of HD 3086 and PBW 343 has been depicted in table 2 also analyzed through roll paper test and the seeds were counted to find out the number of germinated and non-germinated seedlings. The result obtained in both the varieties showed that the germination percentage on all the day of the harvesting were at par with each other though the germination percentage in the varieties was low as to the normal germination percentage of the varieties. The germination percentage in the treatment T_1 (95.33%), T2 (95%), T3 (94.66%) and T4 (94.33%) were having no significant difference and the similar type of result was obtained in the variety PBW 343 T_1 (94.66%), T_2 (94.00%), T_3 (93.66%) and T_4 (93.33%). The result was according to the findings of (Kaushik N. 2003; Mandal et al., 2008; Myint et al., 2010; Moshatati and Gharineh, 2012). As

we all know the facts that, germination is the physio-chemical and biological process which starts with the imbibition of seeds and ends with the emergence of plume and radicle. The first step of the germination is imbibition. The abiotic and biotic factors influences the germination. The factors includes, moisture level, temperature, cold, salinity etc. (Sharma et al., 2013; Shahwani et al., 2014; Feyem et al., 2017).

Dry weight

The seedlings were dried for a period of two days and then the weight was measured to find out the dry weight (Table 3). The dry weight of HD3086 was recorded highest for the T_1 (0.22g) while the T_2 (0.21g) andT_3 (0.20g) were at par with it and the significant difference was seen in the treatment T_4 (0.18g) which gave the lowest dry weight, whilst the variety PBW 343 was also following the similar drift as the HD 3086 the highest dry weight was found in the treatment T_1 (0.15g) while the lowest was found in the treatment T_4 (0.11 g). The seedling dry weight is effected by the seed size and the seed weight which are effected by the date of harvesting. The dry weight of the seedling was showing result similar to the findings of (Khakhi et al., 2008).

Table 3: Effect of harvesting dates on the seedling dry weight

Treatments	Dry Weight(g) HD 3086	Dry Weight(g) PBW 343
T_1	0.22^{a}±0.00	0.15^{a}±0.00
T_2	0.21^{a}±0.00	0.14^{a}±0.00
T_3	0.20^{a}±0.00	0.13^{a}±0.00
T_4	0.18^{b}±0.00	0.11^{b}±0.00

Where, Data are in the form mean± SEM. Significance at P≤0.05 using SPSS ver. 22. T_1: First date of harvesting, T_2: Second date of harvesting, T_3: Third date of harvesting, T_4: Fourth date of harvesting

Table 4: Effect of harvesting dates on the vigour index

Treatments	Vigour Index (HD 3086)	Vigour Index (PBW 343)
T_1	20.89^{a}±0.52	14.12^{a}±0.52
T_2	20.23^{a}±0.58	13.15^{a}±0.50
T_3	19.57^{a}±0.33	12.82^{a}±0.34
T_4	17.34^{b}±0.31	10.60^{b}±0.33

Where, Data are in the form mean± SEM. Significance at P≤0.05 using SPSS ver. 22. T_1: First date of harvesting, T_2: Second date of harvesting, T_3: Third date of harvesting, T_4: Fourth date of harvesting

Vigour Index

The most important parameter to determine the quality of the seed is vigour index there are many ways to calculate the vigour index. One of the best methods is to multiply the germination percentage with the dry weight of the seedling. Applying this

method the vigor index of both the varieties were analyzed (Table 3). The highest vigor index was obtained in the treatment T_1 (20.89) and the lowest vigour index was obtained in the treatment T_4 (17.34) while the treatment T_2 (20.23) and T_3 (19.57) were at par with the treatment T_1. The similar result obtained was in the variety PBW 343 the treatment T1 (14.12) was having the maximum vigour and it was at par with the T2 (13.15) and T3 (12.82) while the significant difference was obtained in the treatment T4 (10.60) which was having the minimum vigour. The vigor index is the property which is dependent upon the seed weight and the seed size and seed weight. The result showed that the treatment which was having more seed index was having the maximum seed vigour and similar were the findings of (Gharineh et al., 2004; Kaydan and Yagmur, 2005; Elliot et al., 2005; Zečević et al., 2006; Haque et al., 2007).

CONCLUSION

It was concluded that there is a direct correlation with the harvesting dates on the yield related attributes of the wheat crop. As the harvesting will be delayed the yield of the crop will show declining trend. The reason could be shattering loses, due to the effect of temperature or if any rainfall occur during that period of time. This will also affect the quality of the seed which will be used next season for sowing purpose. The farmer will be in loss if the harvesting delayed after the crop has already passed the harvesting time. The common practice among the farmer is to use the same seed again and again. If they are using the seed which was harvested when harvesting was delayed the seedling length and ultimately the vigour index of the crop is going to be effected in the next season and the crop stand will not be good.

REFERENCES

Annual report 2016-2017 Department of Agriculture, Cooperation and Farmers Welfare Ministry of Agriculture and Farmers Welfare Government of India Central Statistics Office.

Ali IM, Nulit R, Ibrahim MH, and Uddin MK. 2018. Effect of delay harvest on seed quality and germination of three varieties of soybean (Glycine max) seeds. Plant Archives, 18(2), 1961-1966

Breiman A and Graur D. 1995. Wheat evolution. Israel Journal of Plant Sciences, 43(2), 85-98.

Costa R, Pinheiro N, Almeida AS, Gomes C, Coutinho J and Maçãs, B. 2013. Effect of sowing date and seeding rate on bread wheat yield and test weight under Mediterranean conditions. Emirates Journal of Food and Agriculture, 25(12): 951-961.

Corn Newsletter. 2015. Late harvesting, and grain quality concerns Agronomics crops network.

Elliott, R. H., Mann, L. W., and Olfert, O. 2005. Vigor tests for evaluating the performance of Argentine canola (Brassica napus L.) under different growing conditions. Seed technology, 27(2): 273-285.

FAOSTAT D. 2013. Food and agriculture organization of the United Nations. Statistical database.

Feyem, M.M.N., Bell, J.M., Kenyi, D.M., Dougoua, M.Y.F., Moche, K. 2017. Harvest Date Influence on Seed Germination of Some Nerica Rainfed Rice Varieties. Journal of Rice Research 5 (179):2.

Gharineh, M.H., Bakhshandeh, A. and Ghasemi, G.K. 2004. Vigour and seed germination of the wheat cultivar in Khuzestan environmental condition. The Scientific Journal of Agriculture, 27(1), 65-76.

Haque, A.H.M.M., Akon, M.A.H., Islam, M.A., Khalequzzaman, K.M., and Ali, M.A. 2007. Study of seed health, germination and seedling vigor of farmers produced rice seeds. International Journal of Sustainable Crop Production, 2(5), 34-39.

Kakhki, H.T., Kazemi, M. and Tavakoli, H. 2008. Analysis of seed size effect on seedling characteristics of different types of wheat (Triticum aestivum L.) cultivars. Asian Journal of Plant Sciences, 7(7): 666-671.

Kaushik, N. 2003. Effect of capsule maturity on germination and seedling vigour in Jatropha curcas. Seed Science and Technology, 31(2), 449-454.

Kaydan, D., and Yağmur, M. 2005. Variations in seedling characters of some wheat and barley genotypes during germination. Pakistan Journal of Biological Sciences, 8(9): 1207-1211.

Lesjak, J., and Calderini, D. F. 2017. Increased night temperature negatively affects grain yield, biomass and grain number in Chilean quinoa. Frontiers in plant science, 8, 352.

Laura, 2016. Don't delay wheat harvest Corn newsletter Ohio State University Extension Agronomy Team

Mandal, S.M., Chakraborty, D. and Gupta, K. 2008. Seed size variation: influence on germination and subsequent seedling performance in Hyptis suaveolens (Lamiaceae). Research Journal of Seed Science, 1(1), 26-33.

Moshatati, A. and Gharineh, M.H. 2012. Effect of grain weight on germination and seed vigor of wheat. International Journal of Agriculture and Crop Sciences, 4(8), 458-460.

Myint, T., Chanprasert, W. and Srikul, S. 2010. Effect of seed weight on germination potential of different oil palm (Elaeis guineensis Jacq.) crosses. Seed Science and Technology, 38(1), 125-135.

Shahwani, A.R., Baloch, S.U., Baloch, S.K., Mengal, B., Bashir, W., Baloch, H.N., and Shahwani, A.A. 2014. Influence of seed size on germinability and grain yield of wheat (Triticum aestivum L.) varieties. Journal of Natural Sciences Research, 4(23), 147-155.

Sharma, P., Sardana, V. and Kandhola, S.S. 2013. Effect of sowing dates and harvesting dates on germination and seedling vigor of groundnut (Arachis hypogaea) cultivars. Research Journal of Seed Sciences, 6(1), 1-15.

Ramadas, S., Kumar, T. K., and Singh, G. P. 2019. Wheat Production in India: Trends and Prospects. In Global Wheat Production. IntechOpen.

Zečević V, Knežević D, Mićanović D and Urošević D. 2006. Influence of seed maturity on early seedling vigor in wheat. Kragujevac Journal of Science, 28(1), 165-171.