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Research Article

Impact of harvesting timing and drying methods on yield attributes of wheat variety tj-83

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Abstract

The study was carried out during the year 2015-16 to investigate the impact of harvesting times and drying methods on yield attributes of promising wheat TJ-83. Eight parameters of economic importance were studied which included: moisture content (%), plant height (cm), grains spikes m^{-2}, spikelets $spike^{-1}$, spike length (cm), harvesting index (%), biological yield (kg ha^{-1}) and grain yield (kg ha^{-1}). The results showed that wheat crop harvested on 130 (DAS) resulted in maximum 11.87% moisture content, 83.33 cm plant height, 54.33 grains spikes m^{-2}, 12.11 spikelets $spike^{-1}$, 19.33 cm spike length, 48.18% harvest index, 9946.67 kg biological yield ha^{-1} and 4792.00 kg grain yield ha^{-1}. In case of drying methods, bag store resulted in highest 11.78% moisture content, 81.25 cm plant height, 51.75 grains spikes m^{-2}, 10.91 spikelets $spike^{-1}$, 18.66 cm spike length, 47.39% harvest index, 9693.8 kg biological yield ha^{-1} and 4453.8 kg grain yield ha^{-1} followed by bag (open). Lease figure yield ha^{-1} and 4372.7 kg grain yield ha^{-1}.

Keywords: Drying methods; Harvesting time; Wheat variety; Yield attributes

Introduction

Wheat is an important cereal crop throughout world harvesting is an agronomical technique fully mature harvest wheat spikes causes losses shattering of grains. Hence, it is important to harvest wheat at proper physiological maturity to avoid quantitative and qualitative losses **[1]**. Several models have been employed and categorized a number of physical and physiological processes when occur during the crop yield, notably weather, soil and time management factors influenced by different characteristics of the crop **[2]**. Drying is a suitable method to protect the grains from bacteria and environmental factors such as temperature and relative humidity and allows the grains to ripen, leading to changes in the protein content of the grain. As a result, most of the protein has already been deposited in the grain [3].

The time of harvest is related to such plant characteristics as stage of maturity, tendency to stiffen and split, environmental factors such as rainfall, humidity and temperature [4]. Mode and timing to harvest are likely to be controllable factors that regulate the overall yield of cereal crops. Harvesting starts at different stages of maturity in different regions of the world, depending on the degree of mechanization [5]. Hand harvesting is common in Pakistan due to certain socio-economic reasons, such as small enterprises, expensive mechanization and the fact that wheat straw is mainly needed as animal feed [6]. As the crop reaches maturity, it is subject to strangulation, rain, birds and wildlife, so germination and test weight can be adversely affected by an extremely early or late harvest, which can result in the crushing of the plump and overripe kernels [7] Stress is one of the most important environmental factors affecting plant growth, development and production. Drought, resulting from low rainfall or high temperature, is an uneven phenomenon that affects plants differently depending on the stage of development when the drought occurs [8]. Wheat is sensitive to high temperatures during most reproductive stages on the other hand, rainfall is often limited and temperatures high during the grain-filling period, and water stress during this period is therefore one of the main production constraints in these environments [9]. Lack of water around an thesis can lead to reduced yields by reducing the number of spikes and spikelets and the fertility of the surviving spikelets, and from an thesis to maturity, particularly if accompanied by high temperatures, leaf ageing is accelerated, the duration and rate of grain filling is reduced, leading to a reduction in average kernel weight and dry matter accumulation [10]. Comparisons between favorable and high temperature field environments found more than fourfold differences in wheat yields. These differences were much greater than the yield reductions caused by high temperatures under controlled conditions [11].

In previous studies showed in the growth chamber, reduced yield was mainly attributed to lower kernel weight and only to a small extent to lower kernel number. [12] reported that the accumulation of dry matter decreased due to the reduction in the number of kernels, the green leaf surface during the grain-filling stage decrease when wheat is exposed to high temperatures the number of leaves, the kernel weight and the acceleration of leaf senescence. [13, 14]. High temperatures during kernel filling decreased wheat yield by reducing kernel weigh Maximum loss of grain by mechanical damage or incomplete threshing has been reported when grain moisture content had fallen to 15-23 percent Delayed harvest time could increase the grain yield by 59.8 kg ha^{-1} day^{-1} and also reported that kernel growth rate increased by 0.3 mg $kernel^{-1}$ day^{-1} $^{o}C^{-1}$ over a temperature range of 25–32 ^{o}C [15, 16] Potential nuclear growth did not respond linearly to temperature in the 12-19^{o}C temperature range [17]. In view of the facts stated above, the present study was planned to investigate the impact of various harvesting timing and drying method on yield attributes of wheat variety TJ-83 under agro-ecological conditions of Tandojam. (Please read underline red paragraph of the objective is looking meaningful significant keep this paragraph on yellow paragraph). Keeping in view the improper harvesting concerns and global importance of wheat crop, this study was designed with an objective to demonstrate the role of the wheat various harvesting, and drying timing method to provide the basis yield attributes for future studies regarding the under agro-ecological conditions of Tandojam.

Materials and Methods
The experiment was conducted during 2015-16 at Student's Experimental Farm, Department of Agronomy, Sindh Agriculture University Tandojam, to investigate the impact of harvesting timing and drying methods on yield attributes of promising wheat TJ-83. The experiment was laid out in a three randomized complete block design (RCBD) in a plot size of 3m × 4m (12m^2).

Land preparation
Initially one deep ploughing was done with disc plough followed by levelling and ploughing. The precise land levelling was done to make the soil surface levelled for uniform distribution of irrigation water. The land was ploughed by cultivator cross wise followed by planking to achieve good seed bed.

Sowing time and method
The sowing was done on 07-12-2015 at seed rate of 125 kg ha^{-1} with the help of single row hand drill. The treatment details are as under:

Factor – A (Drying Methods) = 03

M_1 = Bag (Under sun)
M_2 = Bag (Open)
M_3 = Bag (Store)

Factor – B (Harvesting Timing) = 04

T_1 = 110 (DAS)
T_2 = 120 (DAS)
T_3 = 130 (DAS)
T_4 = 140 (DAS)

Fertilizer and Irrigation application
The nitrogen fertilizer was applied in the form of urea @ 168 kg ha^{-1} and phosphorus in the form of DAP @ 84 kg ha^{-1}. All P (Di-ammonium phosphate) and 1/3rd of N (as urea) were applied at the timing of sowing and remaining N was applied in two equal split at 1st and 2nd irrigations, respectively. In all five irrigations were applied as per the crop requirements.

Statistical analysis
The data thus collected was subjected to statistical analysis using MSTAT-C. The LSD test was applied to compare treatments superiority, where necessary (Russel and Eisensmith, 1983).

Results
The study was carried out at Student's Experimental Farm, Department of Agronomy, Sindh Agriculture University Tandojam during Rabi-2016, investigate the impact of harvesting timing and drying methods on yield attributes of promising wheat TJ-83. The treatments included three drying methods and four harvesting dates. The experiment was conducted in a three replicated Randomized Complete Block Design (RCBD) with factorial arrangements having net plot size of 3× 4m (12m^2). Eight parameters of economic importance were studied which included: moisture content (%), plant height (cm), grains spikes m^{-2}, spikelets spike^{-1}, spike length (cm), harvest index (%), biological yield (kg ha^{-1}) and grain yield (kg ha^{-1}).

Moisture content (%)
The results in relation to moisture content of wheat as affected by different harvesting timing and drying methods are shown in (Table 1) and its analysis of variance as Appendix-I. The analysis of variance suggested significant ($P<0.05$) effect of harvesting timing and drying methods on the moisture content, while the interaction between harvesting timing and drying methods on the moisture content was also statistically significant ($P<0.05$).

It can be seen from the results that the moisture content was considerably higher (11.87%) when the crop was harvested on 120 (DAS) followed by 11.75% and 11.54% moisture content noted in plots harvested on 110 and 130 (DAS), respectively. However, the minimum moisture content (9.98%) was achieved in crop harvested on 140 (DAS). Drying method significantly affected moisture content of wheat variety TJ-83. The highest moisture content (11.78%) was observed in bag store drying method followed by (11.29%) in bag open. However, the lowest moisture content (10.77%) was noted in under sun drying method. The results further showed that the interaction of 140 (DAS) × bag (store) resulted in maximum moisture content (12.32%) and the minimum (9.36%) under the interaction of 130 (DAS) × under sun drying method.

Plant height (cm)

The results in relation to plant height of wheat as influenced by different harvesting timing and drying methods are presented in (Table 2), and its analysis of variance is shown as Appendix-II. The analysis of variance described that the plant height was significantly ($P<0.05$) affected by harvesting timing, drying methods and their interaction. The crop harvested on 130 (DAS) produced tallest plants (83.33 cm), followed by 120 and 110 (DAS) with average plant height of 82.77 and 81.00 cm, respectively. However, the late harvested crop on 140 (DAS) resulted in lowest plant height of 77.22 cm. Among drying methods, bag (open) received plants of maximum height (81.25 cm), followed by drying method (under sun) with 81.08 cm plant height and the minimum plant height of 80.91 cm was observed in drying method bag (store). The interactive effect showed that interaction of 130 (DAS) × bag (open) produced maximum plant height (84.66 cm) and the lowest (75.00 cm) in the interaction of 140 (DAS) × under sun. It was observed that delay in harvesting of wheat showed negative impact on the plant height of wheat, probably the increasing temperature resulted in reduced plant moisture and twisting of plants exposed decreased height.

Grains spikes m^{-2}

The data pertaining to number of grains spikes m^{-2} of wheat different harvesting timing and drying methods are presented in (Table 3) and its analysis of variance as Appendix-II. The analysis of variance demonstrated that the grains spikes m^{-2} was significantly ($P<0.05$) influenced by different harvesting timing and drying methods as well as their interaction.

The grains spikes m^{-2} was significantly highest (54.33) in crop harvested on 130 (DAS) followed by 49.88 and 48.44 average grains spikes m^{-2} observed in crop harvested on 120 and 110 (DAS), respectively; while the minimum grains spikes m^{-2} (42.44) was recorded in crop harvested on 140 (DAS). In case of drying method bag (store) resulted in highest grains spikes m^{-2} (51.75) followed by drying method under sun with 48.00 average grains spikes m^{-2}, while the lowest grains spikes m^{-2} (46.58) was observed in drying method bag (open). The results further showed that interaction of 130 (DAS) × under sun drying method resulted in maximum grains spikes m^{-2} (62.33) and the minimum (38.33) in the interaction of 140 (DAS) × bag (open). This indicates that the grains spikes m^{-2} in delayed harvesting decreased considerably; probably this reduction in the grains spikes m^{-2} may be associated with waste of mature crop due to winds, rats and other pests or by ruminants around there.

Spikelets spike^{-1}

The results related to the number of spikelets spike^{-1} of wheat different harvesting timing and drying methods are shown in (Table 4) and its analysis of variance as Appendix-IV. The analysis of variance described that the spikelets spike^{-1} was significantly ($P<0.05$) influenced by different harvesting timing and drying methods as well as them by interaction.

It is apparent from the results that the spikelets spike^{-1} was relatively higher (12.11) in crop harvested on 130 (DAS) followed by 11.56 and 10.33 spikelets spike^{-1} in crop harvested on 120 and 110 (DAS), respectively; while the minimum spikelets spike^{-1} (10.33) was observed in crop harvested on 140 (DAS). In case of drying methods, the highest spikelets spike^{-1} (11.41) was observed in bag (store) followed by 11.00 spikelets spike^{-1} in under sun drying method, while the minimum spikelets spike^{-1} (10.83) was noted in bag (open). It was further observed that the interaction of 130 (DAS) × bag (store) resulted in maximum spikelets spike^{-1} (12.33) and the minimum (8.33) in the interaction of 140 (DAS) × bag (store). The results suggested that the number of spikelets spike^{-1} increased slightly when harvested on 130 (DAS) and the crop delayed up to 140 DAS showed negative trend on this trait. It is obvious that as the crop reaches physiological maturity, birds and other pests start feeding and there is logic of decreasing the spikelets spike^{-1} with delay in harvesting.

Spike length (cm)

The data regards to spike length of various wheat different harvesting timing and drying methods are shown in (Table 5) and its analysis of variance as Appendix-V. The analysis of variance illustrated that the effect of harvesting timing and drying method on spike length was statistically significant (P<0.05) as well as their interaction.

The spike length was relatively higher (19.33 cm) in crop harvested on 130 (DAS) followed by average spike length of 18.61 and 18.11 cm noted in crop harvested on 120 and 110 (DAS), respectively. However, the minimum spike length of 17.11 cm was observed in crop harvested on 140 (DAS). Among drying methods bag (store) produced maximum spike length of 18.66 cm followed by bag (open) with spike length of 18.54 cm and the minimum spike length of 18.16 cm was noted in under sun drying method. Further it was found that the interaction of 130 (DAS) × bag (open) recorded maximum spike length of (20.00 cm). While the minimum spike length (16.66 cm) was recorded in case of 140 (DAS) harvesting × bag (open/store).

Harvest index (%)

The harvest index is the percentage of grain (Yield) from the biological yield ha^{-1}. The data regarding harvest index of wheat different harvesting timing and drying methods are presented in (Table 6) and its analysis of variance as Appendix-VI. Analysis of variance suggested significant (P<0.05) difference in harvest index of different harvesting timing and drying methods and interaction between different harvesting timing x drying methods.

The harvest index was relatively higher (48.18%) in plots harvested on 130 (DAS) followed by 46.29 and 45.65% harvest index achieved in plots harvested on 120 and 110 (DAS), respectively. However, the lowest harvest index (45.34%) was observed in crop harvested on 140 (DAS). The results revealed that the highest harvest index of 47.39% was noted in bag (store) followed by bag (open) with 46.60% harvest index, while the lowest harvest index (45.10%) was recorded under sun. The results further suggested that the interaction of 130 (DAS) × bag (store) resulted in higher harvest index (49.51%). However, the interaction of 140 (DAS) × under sun recorded lowest harvest index (43.13%).

Biological yield ha^{-1} (kg)

The data regarding biological yield ha^{-1} of wheat as influenced by different harvesting timing and drying methods are presented in (Table 7) and its analysis of variance as Appendix-VII. The analysis of variance demonstrated significant (P<0.05) impact of different harvesting timing, drying methods and their interaction.

The biological yield ha^{-1} was highest (9946.7 kg) in crop harvested on 130 (DAS) followed by 9906.7 kg and 9230.0 kg biological yield ha^{-1} noted in plots harvested on 120 and 110 (DAS), respectively. However, the lowest biological yield ha^{-1} (9055.0 kg) was noted in crop harvested on 140 (DAS). In case of drying methods, under sun resulted in highest biological yield ha^{-1} (9693.8 kg) followed by drying method bag (open) with 9520.0 kg biological yield ha^{-1}, while the lowest biological yield ha^{-1} (9390.0 kg) was observed in bag (store). It was noted that the interaction of 130 (DAS) × bag (open) resulted highest biological yield ha^{-1} (10050 kg), while the interaction between 140 (DAS)

× bag (store) recorded lowest biological yield (8540 kg).

Grain yield (kg ha^{-1})

The results in relation to grain yield ha^{-1} of wheat as affected by different harvesting timing and drying methods are shown in (Table 8) and its analysis of variance as Appendix-VII. It can be seed from the data that harvesting timing, drying method and the interaction had significant ($P<0.05$) effect on the above character studied.

It was observed from the results that the grain yield ha^{-1} was relatively higher (4792.0 kg) when the crop was harvested on 130 (DAS) followed by 4522.4 and 4272.9 kg grain yield ha^{-1} noted in plots harvested on 120 and 110 (DAS), respectively. However, the minimum grain yield ha^{-1} (4098.2 kg) was achieved in crop harvested on 140 (DAS). In case of drying methods, bag (store) resulted in highest grain yield ha^{-1} (4453.8 kg) followed by drying method bag (open) with 4437.6 kg grain yield ha^{-1}, while the lowest grain yield ha^{-1} (4372.7 kg) was noted in drying method under sun. The results further showed that the interaction of 130 (DAS) × bag (store) resulted in maximum grain yield ha^{-1} (4891.8 kg) and the minimum grain yield was obtained (3998.3 kg) under the interaction of 140 (DAS) × bag (store).

Table 1: Moisture content (%) as influenced by harvesting timing and drying methods

Harvesting timing	**Drying Method**			**Mean**
	Under sun	**Bag (Open)**	**Bag (Store)**	
110 (DAS)	11.28	11.78	12.20	**11.75 B**
120 (DAS)	11.07	11.56	11.98	**11.87A**
130 (DAS)	9.36	9.94	10.63	**11.54 C**
140 (DAS)	11.39	11.89	12.32	**9.98 D**
Mean	**10.77 C**	**11.29 B**	**11.78 A**	**-**
	Harvesting timing		**Drying method**	**Interaction**
S.E.±	8.9103		7.7170	0.0154
LSD 0.05	0.0185		0.0160	0.0320
LSD 0.01	8.9103		7.7170	0.0154
CV%	0.17		-	-

Table 2: Plant height (cm) as influenced by harvesting timing and drying methods

Harvesting timing	**Drying Method**			**Mean**
	Under sun	**Bag (Open)**	**Bag (Store)**	
110 (DAS)	81.00	82.00	80.00	**83.00 B**
120 (DAS)	81.66	82.66	84.00	**83.33 A**
130 (DAS)	80.66	84.66	84.66	**82.77 C**
140 (DAS)	80.33	75.00	76.33	**81.90 D**
Mean	**81.08 AB**	**81.25 A**	**80.91 B**	**-**
	Harvesting timing	**Drying method**	**Interaction**	
S.E.±	1.4811	1.2827	2.5653	
LSD 0.05	3.0716	2.6601	5.3201	
LSD 0.01	4.1748	3.6155	7.2310	
CV%	3.87	-	-	

Table 3: Grain spike (m^2) as influenced by harvesting timing and drying methods

Harvesting timing	Drying Method			Mean
	Under sun	Bag (Open)	Bag (Store)	
110 (DAS)	41.00	48.33	56.00	**48.44 AB**
120 (DAS)	47.33	51.00	51.33	**49.88 AB**
130 (DAS)	62.33	48.67	52.00	**54.33 A**
140 (DAS)	41.33	38.33	47.66	**42.44 B**
Mean	**48.00 B**	**46.58 C**	**51.75 A**	-
	Harvesting timing	**Drying method**		**Interaction**
S.E.±	4.3348	3.7541		7.5081
LSD 0.05	8.9899	7.7855		15.571
LSD 0.01	12.219	10.582		21.164
CV%	18.85	-		-

Table 4: Spikelets $spike^{-1}$ as influenced by harvesting timing and drying methods

Harvesting timing	Drying Method			Mean
	Under sun	Bag (Open)	Bag (Store)	
110 (DAS)	10.33	10.00	10.66	**10.33 C**
120 (DAS)	11.00	11.33	12.33	**11.56 B**
130 (DAS)	12.33	11.66	12.33	**12.11 A**
140 (DAS)	9.13	9.33	8.33	**8.93 D**
Mean	**10.69 AB**	**10.58 AB**	**10.91 A**	-
	Harvesting timing	**Drying method**		**Interaction**
S.E.±	0.7599	0.6581		1.3162
LSD 0.05	1.5759	1.3648		2.7296
LSD 0.01	2.1420	1.8550		3.7100
CV%	14.54	-		-

Table 5: Spike length (cm) as influenced by harvesting timing and drying methods

Harvesting timing	Drying Method			Mean
	Under sun	Bag (Open)	Bag (Store)	
110 (DAS)	17.33	17.66	19.33	**18.11 C**
120 (DAS)	19.33	18.84	17.66	**18.61 B**
130 (DAS)	18.00	20.00	20.00	**19.33 A**
140 (DAS)	18.00	16.66	16.66	**17.11 D**
Mean	**18.16 C**	**18.54 B**	**18.66 A**	-
	Harvesting timing	**Drying method**	**Interaction**	
S.E.±	1.1244	0.9738	1.9475	
LSD 0.05	2.3319	2.0195	4.0390	
LSD 0.01	3.1695	2.7448	5.4897	
CV%	13.13	-	-	

Table 6: Harvest index (%) as influenced by harvesting timing and drying methods

Harvesting timing	Drying Method			Mean
	Under sun	Bag (Open)	Bag (Store)	
110 (DAS)	44.46	45.72	46.77	**45.65 C**
120 (DAS)	45.48	46.91	46.48	**46.29 B**
130 (DAS)	47.34	47.68	49.51	**48.18 A**
140 (DAS)	43.13	46.09	46.82	**45.34 D**
Mean	**45.10 C**	**46.60 B**	**47.39 A**	-
	Harvesting timing	**Drying method**		**Interaction**
S.E.±	2.17803	1.88603		3.77203
LSD 0.05	4.51703	3.91203		7.82303
LSD 0.01	2.17803	1.88603		3.77203
CV%	0.01	-		-

Table 7: Biological yield (kg ha^{-1}) as influenced by harvesting timing and drying methods

Harvesting timing	Drying Method			Mean
	Under sun	Bag (Open)	Bag (Store)	
110 (DAS)	9240	9150	9300	**9230.0 C**
120 (DAS)	9880	10000	9840	**9906.7 B**
130 (DAS)	9910	10050	9880	**9946.7 A**
140 (DAS)	9745	8880	8540	**9055.0 D**
Mean	**9693.8 A**	**9520.0 B**	**9390.0 C**	-
	Harvesting time	**Drying method**	**Interaction**	
S.E.±	2.3384	2.0251	4.0503	
LSD 0.05	4.8496	4.1999	8.3997	
LSD 0.01	6.5914	5.7084	11.417	
CV%	0.05	-	-	

Table 8: Grain yield (kg ha^{-1}) as influenced by harvesting timing and drying methods

Harvesting timing	Drying Method			Mean
	Under sun	Bag (Open)	Bag (Store)	
110 (DAS)	4203.0	4292.8	4322.8	**4272.9 C**
120 (DAS)	4392.7	4572.4	4602.3	**4522.4 B**
130 (DAS)	4692.2	4792.0	4891.8	**4792.0 A**
140 (DAS)	4203.0	4093.2	3998.3	**4098.2 D**
Mean	**4372.7 A**	**4437.6 B**	**4453.8 C**	-
	Harvesting timing	**Drying method**	**Interaction**	
S.E.±	1.0297	0.8917	1.7835	
LSD 0.05	2.1354	1.8493	3.6987	
LSD 0.01	2.9024	2.5136	5.0272	
CV%	0.05	-	-	

Discussion

Generally, the wheat is harvested when it is apparently looks full mature indicating complete dry spikes. However, studies indicate that harvesting over-mature wheat causes losses due to shattering of grains and also delays the sowing of subsequent crop to be planted after wheat harvest **[18]**. The present study was therefore, carried out to investigate the impact of various harvesting timing and drying method on yield attributes of wheat variety TJ-83 under **[19]** agro-ecological conditions of Tandojam.

The present study showed that the crop harvested on 130 (DAS) showed maximum plant height 82.77 cm plant height, 49.88 grains spikes m^{-2}, 11.56 spikelets $spike^{-1}$, 19.33 cm spike length, 48.18% harvest index, 9946.7 kg biological yield ha^{-1} and 4792.0 kg grain yield ha^{-1}; while 120, 110 and 140 (DAS) harvested wheat showed gradual reduction in values for almost all the traits examined. The delay in harvesting up to 140 DAS caused a marginal decrease in grain yield ha^{-1}, which was mainly associated with decreased foliage weight with increasing temperature in April. Drying methods bag (store) performed superiorly with higher grain yield ha^{-1} as compared to other tested drying methods, but harvest index was better in drying methods. The results of the present study are in line with those who reported that the grain yields for all cv. were reduced by 10% on average when harvesting was delayed by 21 days over the 3-yr period. The results of the present study are fully supported who reported that grain yields of Egret and 70W 18-14 wheat decreased with delayed harvest in 1979 and 1980, the rate of decrease being (%/d) 0.53 and 0.49, respectively, for Egret, and 0.53 and 0.18 for 70W 18-14. In 1981, harvested grain yields for Egret and Madden wheat did not change significantly when harvesting was delayed up to 63d. Reported that the overall, delaying harvest of winter wheat in the southeast reduced yield, test weight, and negatively impacted milling and baking quality factors related to carbohydrate levels in the grain. These results are in contrast with those who reported that delayed harvest time could increase the grain yield of wheat whereas found that grain yield was reduced an average of 25% compared with the full-season check when plants were harvested at the joint stage and resulted in insignificant losses in grain yield. Suggested that kernel growth rate may be directly influenced by temperature. Concluded that when harvest time of two wheat varieties delays 5 days, it causes 0.4-0.9 % increase in insect pest attack on seeds in natural conditions; while when harvesting time of both wheat varieties delays 5 days, it caused 1.0-7.7 % pest sucking rate increase on seeds.

Conclusion and Suggestions

After going through the results of the present study, it was concluded that harvesting on 130 DAS proved to be superior in all agronomical parameters followed by 120 and 110 DAS. Delayed harvesting (140 DAS) showed negative impact on yield and yield contributing parameters. In case of drying methods, bag (store) is suitable for getting more grain yield (kg ha^{-1}) in wheat crop instead of bag (open) and under sun. On the basis of present results, it is recommended that wheat crop will be harvested after 130 days of sowing for achieving maximum grain yield kg ha^{-1}. Bag (store) is suitable drying method for getting more grain yield (kg ha^{-1}) in wheat crop as compared to other drying methods.

Authors' contributions

Conceived and designed the experiments: A Nabi & S Ahmed, Performed the experiments: A Nabi & S Ahmed, Analysed the data: M Ahmed, contributed reagents/ materials/ analysis tools: NA Alizai, M Ibrahim & M Ahmed, Wrote the paper: A Nabi & S Ahmed.

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