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RELATIONSHIP BETWEEN HARVESTING DATES, YIELD AND SEED QUALITY OF SOME WHEAT VARIETIES

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ABSTRACT

This work was carried out at Tag El-Ezz Agriculture Research Station, El-Dakahlia Governorate during 2005/ 2006 and 2006/ 2007 seasons to study the effect of harvesting dates i. e. 50, 60, 70 and 80 days after 50% heading on yield, yield components, seed germination, seedling vigour traits and its chemical composition (protein, carbohydrate) contents of some wheat cultivars i. e. Sakha 93, Giza 168, Gemmiza 9 and Gemmiza 10. The results revealed that. Harvesting wheat after 50 to 70 days from 50% heading increased gradually both of grain yield/ feddan, 1000-grain weight and quality characters of seed, namely germination percentage and germination rate, plumule and radical length, seedling dry weight, seedling vigor index, carbohydrate content and germination after seed aging in both seasons. However, delaying harvest to 80 days from 50% heading decreased moisture content and electrical conductivity of seed. Harvesting Plants at 50, 60 and 80 days after 50% heading reduced grain yield 60.84, 16.24 and 3.91% in the first season and 64.17, 18.96 and 5.08% in the second season, comparing with harvest at 70 days after 50% heading in both respective seasons. Wheat cultivar Giza 168 surpassed the other cultivars in grain yield/ fed., 1000-grain weight, germination percentage and germination rate, germination after seed aging, electrical conductivity and protein content in both seasons, while, wheat cultivar Gemmiza 9 surpassed the other cultivars in plumule and radical length, seedling dry weight, seedling vigour index and carbohydrate content in both seasons. The interaction between harvesting dates and wheat varieties had significant effects on all the most studied characters. At 70 days after 50% heading, wheat variety Giza 168 recorded the highest grain yield (21.92 and 21.69 ardab/ fed.), 1000-grains weight and germination percentage and rate. ○○○At 80 days after 50% heading, wheat cultivar Gemmiza 9 gave the highest seedling dry weight and seedling vigour index, while Giza 168 gave the highest germination after seed aging. Positive correlations were observed between harvesting dates and the most wheat traits except for seed moisture content and electrical conductivity. In conclusion, wheat cultivars can be harvested after 60 to 70 days after 50% heading with obtaining high yield and good seed quality.

INTRODUCTION

Wheat (*Triticum aestivum*, L.) is considered one of the most important cereal crops overall the world and the main cereal crop in Egypt. Considerable efforts should be paid to increase its productivity and quality for minimizing the gab between production and consumption. Increasing wheat productivity can be achieved through the cultivation of high yielding varieties and improving agronomic practices. Harvesting time is an important factor to increase the total crop yield. In Egypt, wheat is harvested in summer months from the end of April until Jun. If the harvest start late, the grain becomes to dry and rate of grain shattering well be higher, wheat plants exposed to lodging, birds, rodents and the adverse climatic. On the contrary, if the harvest starts early, the moisture content of grains will be high and grains will

be against with mould. Wheat should be dry enough for threshing and storage. So many researches reported that wheat plants must be harvested with minimum losses to realize the maximum return from all production practices. Johnson *et al*., (1980) in USA reported that average yield losses was about 10% when wheat delayed at harvest by 21 day in the mid Atlanta. Farrer *et al*., (2006) concluded that yield losses of nearly 20% were possible with only 8 days between harvests; the total precipitation and the prevalent temperature are important factors affecting seed quality. They also added seed shattering increase as grain dries and hot dry weather facilitates these dry processes. Sinclair and Jamieson (2008) and El Ganbeehy *et al*., (1993) reported that harvest dates showed significant effects on wheat grain yield, spike number/ m^2, number of spikletes/spike and number of grains/spike, they also added that, harvest date should be practiced early within two weeks after full maturity to give high grain yield. The delay in harvest date after that had adverse effects on the grain yield.

Seed is an indispensable input in agricultural production. The level of harvest obtained at end of seasons depends at least partially on the quality of the seed planted by farmers, seed quality and germination termed physiological quality according to Louwaars and Van Marrewijk (1996), and it is the most important trait. Also Qun et al., (2007) reported that, seed vigor is a more promising seed quality character reflecting potential seed germination, field emergence, physiological maturity of the seed at harvest defined, as the time enough for seeds to reach its maximum dry weight and its one of the factors that influence the vigor of any seed lot. On the other side, Rasyad *et al*., (1990), concluded that harvesting wheat at physiological maturity stage is the best for wheat genotypes to attain the highest level of seed viability.

Concerning to wheat varieties, Abd-Alla, (1996), Moghadam *et al*., (1999) and Orenda, (1999), mentioned that, significant differences were noticed among wheat cultivars in yield, yield components and seed quality under different harvesting dates. Ray and Gupta, (1980), reported electrical conductivity negatively correlated with filed parameters in rice. Also, Mersal, (2005), found that highly positive and negative significant correlations between harvesting dates and seed and seedling vigor characters in rice.

Thus, the aim of this study was to investigate effect of different harvesting dates on yield, seed germination and seedlings vigor of some wheat varieties and determine the suitable harvesting date with high yield and seed quality.

MATERIALS AND METHODS

This investigation was carried out at Tag-El-Ezz Research Station, Agricultural Research Center and the Laboratory of Seed Technology Research Unit El Mansoura, Dakhlia Governorate, Egypt during 2005/ 2006 and 2006/ 2007 seasons. The purpose was to study the relationship between harvesting dates, yield and seed technology traits. A split plot design with three replicates was used and the main plots were assigned to harvesting dates and the cultivars were allocated to the sub plots. The area of each sub plot was 10.5 m^2 (3x3.5 m).

The experimental factors were: the first factor was harvesting dates, four harvesting dates 50 (H_1), 60 (H_2), 70 (H_3) and 80 (H_5) days from 50% heading were studied "days to 50% heading of tested wheat cultivars under the experimental conditions in both seasons were 103 day for Sakha 93 and 104 day for the remaining wheat cultivars" . While the second factor was wheat cultivars, Sakha 93 (V_1), Giza 168 (V_2), Gemmiza 9 (V_3) and Gemmiza 10 (V_4). Seeds of these varieties were obtained from wheat Res. Depart, Field Crops Research Institute, ARC.

The soil of the experimental sites was prepared as for wheat cultivation. Soil sample were taken at random from the experimental area to determine the mechanical and chemical properties in 2005/ 2006 and 2006/ 2007 seasons, as shown in Table 1. Seeds were broadcasted by hand on 10th and 15th of November during the first and second seasons, respectively. All other agronomic practices were done as recommended of the region for the wheat crop cultivation.

Table (1): Mechanical and chemical analyses of the experimental sites:-

Characters	Seasons	
	2005/ 2006	2006/ 2007
Mechanical analysis		
Sand %	24.00	11.60
Silt %	27.30	21.00
Clay %	46.60	66.40
Textural class	Clay	Clay
Chemical analysis fraction		
Na^+ (mg/100 g)	3.24	2.10
K^+ (mg/100 g)	0.10	0.07
Organic matter %	1.2	1.3
Available N ppm	75	63
Available K ppm	322	640
Available B ppm	13	16

Recorded data:-

At harvest plants of center area of 1 m^2 of each sub plot were harvest and the data are recorded:

1- Seed moisture content: Ten spikes of the main stems were taken from each plot and handy thrashed and after that seed moisture content was determined according to ISTA, (1985). It was determined according to ISTA, (1985).

2- Grain yield (ardab/ fed.): Plants of the center area of 1m^2 of each plot were harvested, dried, tied, thearched and grain yield in 1m^2 was estimated and grain yield (ardab/ fed.) was calculated.

3- 1000- Kernel weight (g): Four random samples were used to count and record it.

4- Grain protein percentage: Estimated according to the improved Kjldahl method of AOAC, (1999).

5- Grain total carbohydrates content: Measured according to Dubois and Gilles, (1956).

Random sample of 400 seeds were taken from each harvest date and divided into four replicates and germinated under laboratory conditions at 20±2 c^o on filter paper in sterilized Petri dishes for 8 days to estimate the followings:

a- Germination percentage:- It was measured according to the method outlined in the rules for seed testing (ISTA, 1999) and defined as the total number of normal seedlings after 8 days.

b- Germination rate:- It was defined according to the procedure reported by Barteltt, (1937).

$$\text{G. r.} = \frac{a + (a + b) + (a + b + c) + \ldots\ldots + (a + b + c + m)}{n\,(a + b + c + \ldots\ldots\ldots + m)}$$

Where (a, b and m) number of seedlings emerged at the first count, second count and final count and (n) it is the number of counts.

c- Plumule and Radical length (cm): During the final count, ten normal seedlings from each replicate were taken randomly to measure plumule and radical length (cm.)

d- Seedlings dry weight (g):- During the final count, ten normal seedlings from each replicate were taken and dried in hot-air oven at 85 C^o for 12 hours and weighted to estimate seedlings dry weight (g) according to Krishnasamy and Seshu, (1990).

e- Seedling vigour index = Seedling dry weight x Germination percentage

f- Accelerated aging (Germination after aging):- It was estimated according to ISTA. (1985).

g- Electrical conductivity *(umohs/g seed*):- It was calculated according to Matthews and Alison (1987)

Fifty seeds, in three replications were weight to 2 decimal places and placed in a 500 ml flask and 250 ml of distilled water was added. The flask were covered and placed in an incubator at a constant temperature of 20 C^0 for 24 hours after which the contents of the flasks were gently stirred. The electrical conductivity was measured in the solution after removing the seeds. The HANNA conductivity meter (Hi 80333) was used. The results were reported as U mohs per one gram of seed (*U mohs/ gm seed*). The meaning of two readings was calculated as follows.

$$\text{Conductivity reading} = \frac{\text{Reading of replicate 1}}{\text{Wt. of 50 seeds in replicate 1}} + \frac{\text{Reading of replicate 2}}{\text{Wt. of 50 seeds in replicate 3}} \div 2$$

Data were statistically analyzed as the technique of the ANOVA. The treatment and means were compared using the least Significant Differences (LSD) according to Gomez and Gomez (1984).

RESULTS AND DISCUSSION

1- Harvesting date effect:

Data in Table (2) show the effect of harvesting dates on seed moisture content, grain yield (ardab/ fed., 1000- grains weight (g), seed protein and carbohydrate content. Seed moisture content, decreased gradually as delayed harvest date up to 80 days after 50% heading in both seasons. The highest moisture content (39.95 and 40.10%) was recorded when wheat plants harvested at 50 days after 50% heading, but the lowest moisture content (11.20and 10.38%) was found with seed planted settled up to 80 days after 50% heading in 2005/ 2006 and 2006/ 2007 seasons, respectively. Delaying harvest date from 50 days up to 70 days after 50% heading increased grain yield per feddan, 1000- grains weight and seed carbohydrate content, on contrast these traits were decreased at harvest date 80 days after 50% heading in both seasons. Wheat plants harvested at 70 days after 50% heading surpassed plants harvested at 50 days after 50% heading in grain yield per feddan 60.57% and 64.17%, 1000-grain weight by 17.73% and 18.20% and seed carbohydrate percentage by 3.06% and 1.80% in 2005/ 2006 and 2006/ 2007 seasons, respectively. In this connection, seed wheat harvested at 80 days after 50% heading gave 22.49% and 19.57% increase in protein percentage as compared with harvest date 50 days after 50% heading in both seasons, respectively. The increase in grain yield at harvest date 70 days after 50% heading may be attributed to this harvest date correspond to full maturity stage while dry matter translocated and storage completed in wheat seed which led to enhanced 1000 seed weight resulted in raising seed yield and seed carbohydrate content. These results are in agreement with those obtained by El- Ganbeehy *et al*. (1993), Abd-Alla (1996), Yuan- Jianping *et al*. (1996), Kolek *et al*. (1997), Moghadam (1999), Orenda (1999), Sato *et. al*. (1999), El- Mowafy (2004) and Farrer *et al.* (2006).

Table (2): Effect of harvesting dates and wheat cultivars on moisture content, grain yield, 1000- grains weight, seed protein content and seed carbohydrate content in 2005/ 2006 and 2006/ 2007 seasons.

Treatments	Moisture content (%)		Grain yield (ardab/ feddan)		1000- grains weight (gm)		Seed Protein content		Seed carbohydrate content	
	2005/06	2006/07	2005/06	2006/07	2005/06	2006/07	2005/06	2006/07	2005/06	2006/07
A- Harvest date										
50 DA50%H	39.95	40.10	13.06	12.84	39.19	38.58	10.27	10.17	69.68	70.38
60 DA50%H	20.16	19.48	18.04	17.72	42.75	42.25	11.93	11.56	71.58	71.42
70 DA50%H	12.38	11.57	20.97	21.08	46.14	45.60	12.47	12.11	71.81	71.65
80 DA50%H	11.20	10.38	20.18	20.06	45.22	44.63	12.58	12.16	70.67	70.54
L.S.D. at 5%	0.52	0.36	0.11	0.11	0.18	0.36	0.08	0.28	0.22	0.15
B- Varieties										
Sakha 93	20.87	20.83	17.90	17.56	43.95	43.29	11.66	11.35	72.27	73.04
Giza 168	20.32	19.50	18.90	18.62	45.36	45.12	12.35	11.96	66.02	65.69
Gemmiza 9	20.73	20.24	18.10	18.07	43.40	42.74	11.75	11.49	72.91	72.80
Gemmiza 10	21.77	20.95	17.36	17.46	40.59	39.90	11.49	11.20	72.54	72.48
L.S.D. at 5%	0.34	0.25	0.09	0.09	0.23	0.31	0.06	0.25	0.19	0.90

Data in Table (3) show the effect of harvesting dates on germination percentage, germination rate, germination after aging and electrical conductivity (*umohs/g seed)* of some wheat cultivars in 2005/ 2006 and 2006/ 2007 seasons.

These results indicate that harvest dates 60, 70 and 80 days after 50% heading significantly increased germination percentage as compared with 50 days after 50% heading in both seasons. The differences among harvest dates 60, 70 and 80 days after 50% heading did not reach to the level of significance in germination percentage in the first season. These harvest dates gave the highest germination percentage (98%) in the first and (97, 99 and 99%) in the second season respectively), but harvest date 50 days after 50% heading had the lowest once (94 and 93%) in both seasons. Also, harvest date 70 days after 50% heading gave the highest germination rate and germination after aging comparing with the other studied harvest dates in the two seasons. This harvest date 70 days after 50% heading gave the highest germination rate (0.924) and

Table (3): Effect of harvesting dates and wheat cultivars on germination percentage, germination rate, accelerated aging and electrical conductivity in 2005/ 2006 and 2006/ 2007 seasons.

Treatments	Germination (%)		Germination rate		Germination after aging (%)		Electrical conductivity *(umohs/g seed*)	
	2005/06	2006/07	2005/06	2006/07	2005/06	2006/07	2005/06	2006/07
A- Harvest date								
50 DA50%H	94	93	0.731	0.726	78	77	0.064	0.061
60 DA50%H	98	97	0.917	0.913	79	78	0.057	0.054
70 DA50%H	98	99	0.929	0.924	80	80	0.054	0.052
80 DA50%H	98	99	0.919	0.915	79	79	0.046	0.042
L.S.D. at 0.0 5%	0.4	0.4	0.008	0.009	0.6	0.7	0.001	0.002
B- Cultivars								
Sakha 93	97	97	0.871	0.866	79	79	0.054	0.051
Giza 168	98	98	0.882	0.878	81	81	0.051	0.048
Gemmiza 9	98	97	0.870	0.865	79	79	0.055	0.052
Gemmiza 10	97	97	0.873	0.869	78	78	0.060	0.058
L.S.D. at 0.0 5%	0.2	0.6	0.005	0.004	0.6	0.5	0.002	0.001

germination after seed aging (80%), while the lowest germination rate (0.731 and 0.726) and germination after seed aging (78 and 77%) were recorded with harvest date 50 days after 50% heading in both seasons, respectively. Electrical conductivity significantly decreased with delayed harvest date up to 80 days after 50% heading in both seasons. Harvest date 50 days after 50% heading gave the highest electrical conductivity (0.064 and 0.061 *umohs/g seed)*, but Harvest date 80 days after 50% heading gave the lowest once (0.046 and 0.042 *umohs/g seed)* in 2005/ 2006 and 2006/ 2007 seasons, respectively. The increase in the germination percentage, germination rate and germination after aging and decrease in electrical conductivity due to delaying harvesting date may be attributed to the delay of harvest increased seed size and carbohydrate content which improved seed quality and provided seedlings by nutrients during germination. These results

are in the same line with those of Rasyad *et al*. (1990, Abd- Alla (1996) and El- Mowafy (2004).

Results recorded in Table (4) show the effect of harvesting dates on plumule and radical length (cm), seedling dry weight (gm) and seedling vigour index of some wheat cultivars in 2005/ 2006 and 2006/ 2007 seasons.

Table (4): Effect of harvesting dates and wheat cultivars on plumule length (cm), radical length (cm), seedling dry weight (gm) and seedling vigour index in 2005/ 2006 and 2006/ 2007 seasons.

Treatments	Plumule length (cm)		Radical length (cm)		Seedling dry weight (gm)		Seedling vigour index	
	2005/06	2006/07	2005/06	2006/07	2005/06	2006/07	2005/06	2006/07
A- Harvest date								
50 DA50%H	5.83	5.56	6.04	6.06	0.632	0.621	59.11	60.44
60 DA50%H	5.91	5.73	6.38	6.34	0.663	0.652	65.17	63.75
70 DA50%H	6.13	5.96	6.53	6.50	0.690	0.683	68.44	67.75
80 DA50%H	6.38	6.14	6.73	6.75	0.686	0.681	68.25	67.40
L.S.D. at 0.0 5%	0.11	0.09	0.01	0.14	0.010	0.012	1.08	1.09
B- Cultivars								
Sakha 93	5.63	5.46	6.16	6.03	0.634	0.626	61.83	61.13
Giza 168	6.18	5.73	6.61	6.31	0.682	0.674	67.10	66.64
Gemmiza 9	6.43	6.18	6.63	6.92	0.688	0.678	67.17	66.87
Gemmiza 10	6.01	6.03	6.29	6.38	0.666	0.658	64.86	64.69
L.S.D. at 0.0 5%	0.08	0.10	0.12	0.18	0.009	0.009	0.78	0.91

The results illustrate that harvest dates significantly differed in plumule length (cm), radical length (cm), seedling dry weight (gm) and seedling vigor index in 2005/ 2006 and 2006/ 2007 seasons. Wheat seed Harvested at 80 days after 50% heading gave the highest plumule and radical length (6.38 and 6.14 cm) and (6.73 and 6.75 cm) in 2005/ 2006 and 2006/ 2007 seasons, respectively. Wheat seed Harvested at 60 days after 50% heading gave the highest seedling dry weight and seedling vigour index (0.690 gm and 68.44) and (0.683 gm and 67.75) in the first season and second season, respectively. On the contrary, the lowest values of plumule length (5.83 and 5.56 cm), radical length (6.04 and 6.06 cm), seedling dry weight (0.632 and 0.621 gm) and seedling vigour index (59.11 and 60.44) were recorded with harvest date 50 days after 50% heading in 2005/ 2006 and 2006/ 2007 seasons, respectively**.** Harvesting wheat seed at 60 and 70 days after 50% heading was the best date to harvest wheat seed while the period from heading to harvesting was enough to gave the enhanced to the assimilated materials to translocated and stored dry matter into seed which led to the increase in seed dry weight as well as yield and yield components, seed and seedlings vigor. These results are in agreement with those of Rasyad *et al.* (1990, Abd- Alla (1996) and El- Mowafy (2004). We can harvest wheat ten days (60 days after 50% heading) without harmful effects on yield and seed quality traits comparing with harvest other 70 days after 50% heading.

11- Cultivars variation:

Data in Tables 2, 3 and 4 shows that wheat cultivars significantly differed in all studied traits in both seasons. Wheat cultivar Gemmiza 10 gave

the highest seed moisture content (21.77 and 20.95), but, wheat cultivar Gemmiza 9 gave the highest carbohydrate content (72.91 and 72.80%), plumule length (6.43 and 6.18 cm), radical length (6.63 and 6.92 cm), seedling dry weight (0.688 and 0.678 gm) and seedling vigour index (67.17 and 66.87) in 2005/ 2006 and 2006/ 2007 seasons, respectively**.** In this trend variety Giza 168 was superior in 1000-grain weight (45.36 and 45.12 gm), grain yield (18.90 and 18.62 ardab/ feddan), seed protein content (12.35 and 11.95%), germination percentage (98 and 98%), germination rate (0.882 and 0.878) and germination after seed aging (81%), in this trend the same cultivar recorded the lowest values of electrical conductivity (0.051 and 0.048 *umohs/g seed*) in 2005/ 2006 and 2006/ 2007 seasons, respectively. From these results it could be seen that cultivar Giza 168 was superior cultivar because it gave the highest values in most studied traits compared to other used cultivars in both seasons. These results are in agreement with those obtained by Rasyad *et al*. (1990), Abd-Alla (1996), Kolek *et al.* (1997), MOghadam *et al*. (1999), Oredna (1999) and Tomar *et al.* (2001).

111- Interaction effects:

Harvesting dates x varieties.

The data concerned the effect of the interaction between harvesting dates and wheat cultivars are recorded in Tables (5, 6, and 7), high significant effects were noticed on all the studied traits.

Table (5): Effect of interaction between harvesting dates and wheat varieties on moisture content, grain yield, 1000- grains weight and protein content in 2005/ 2006 and 2006/ 2007 seasons.

	Moisture content (%)				Grain yield (ardab/ fed.)				1000- grains weight (gm)				Protein percentage (%)			
	2005/ 2006				2005/ 2006				2005/ 2006				2005/ 2006			
	V1	V2	V3	V4	V1	V2	V3	V4	V1	V2	V3	V4	V1	V2	V3	V4
H1	**38.52**	**39.74**	40.42	41.14	12.72	13.51	13.62	12.41	39.75	40.40	39.17	37.44	10.30	10.87	10.02	9.91
H2	**21.31**	**18.89**	19.92	20.51	17.91	18.90	17.86	17.50	42.70	44.89	42.47	40.95	11.90	12.77	11.94	11.15
H3	**12.11**	**11.77**	12.41	13.23	20.94	21.92	20.95	20.09	47.15	48.71	46.42	42.28	12.03	12.81	12.48	12.48
H4	**11.55**	**10.87**	10.19	12.20	20.04	21.28	19.98	19.43	46.19	47.45	45.54	41.68	12.43	12.96	12.61	12.42
L.S.D. 5%	0.57				0.15				0.27				0.14			
	2006/ 2007				2006/ 2007				2006/ 2007				2006/ 2007			
	V1	V2	V3	V4	V1	V2	V3	V4	V1	V2	V3	V4	V1	V2	V3	V4
H1	**39.41**	**38.96**	40.40	41.64	12.49	13.27	13.36	12.23	39.04	39.35	39.06	36.87	10.21	10.72	9.98	9.80
H2	**21.92**	**17.81**	18.74	19.47	17.51	18.62	17.56	17.22	42.27	44.79	41.42	40.51	11.40	12.08	11.67	11.08
H3	**11.37**	**11.13**	11.63	12.18	20.45	21.69	21.16	21.04	46.52	48.57	45.81	41.50	11.65	12.38	12.13	12.29
H4	**10.65**	**10.13**	10.20	10.53	19.79	20.91	20.21	19.36	45.33	47.77	44.70	40.73	12.14	12.65	12.20	11.64
L.S.D. 5%		0.46				0.17				0.57				0.45		

H1, H2, H3, and H4 = 50, 60, 70 and 80 days after 50% heading
V1= Sakha 93, V2= Giza 168, V3= Gemmiza 9 and V4= Gemmiza 10

At 50 days after 50% heading, wheat cultivar Gemmiza 10 gave the highest values of moisture content (41.14 and 41.64%) but, cultivar Gemmiza 9 and Giza 168 gave the lowest values of moisture content (10.19 and 10.13%) at 80 days after 50% heading in the first and second seasons,

respectively. Wheat cultivar Giza 168 at harvest date 70 days after 50% heading gave the highest values of grain yield (21.92 and 21.69 ardab/feddan), 1000-grain weight (48.71 and 48.57 gm), germination rate (0.935 and 0.933), but, at 80 days after 50% heading this cultivar gave the highest values of protein content (12.96 and 12.65 %), germination after seed aging (83 and 83 %) in both seasons, respectively. Plants harvested at 80 days after 50% heading wheat cultivar Gemmiza 9 gave the highest values of plumule length (6.78 and 6.35 cm), radical length (7.13 and 7.47 cm), seedling dry weight (0.716 and 0.703 gm) and seedling vigour index (70.95 and 69.90) in both seasons, respectively. At harvest date 80 days after 50% heading wheat cultivars Giza 168 recorded the lowest reading of electrical conductivity (0.041 and 0.038 *umohs/g seed*) in the first and second seasons. On the other hand, wheat seed cultivars Giza 168, Gemmiza 9 and Gemmiza 10 gave the highest values of germination percentage (100 %) at harvest date 80 days after heading in 2005/ 2006 and 2006/ 2007 seasons, respectively.

Table (6): Effect of interaction between harvesting dates and wheat varieties on germination percentage, germination rate, accelerated aging and electrical conductivity in 2005/ 2006 and 2006/ 2007 seasons.

	Germination (%)				Germination rate				Germination after seed aging (%)				Electrical conductivity (*U mohs/gm seed*)			
	2005/ 2006				2005/ 2006				2005/ 2006				2005/ 2006			
	V1	V2	V3	V4	V1	V2	V3	V4	V1	V2	V3	V4	V1	V2	V3	V4
H1	93	95	94	93	0.734	0.741	0.721	0.726	77	79	79	77	0.060	0.060	0.063	0.072
H2	98	99	98	98	0.910	0.923	0.915	0.920	79	80	79	78	0.056	0.052	0.059	0.060
H3	100	100	99	100	0.925	0.935	0.925	0.931	81	82	80	79	0.054	0.051	0.051	0.059
H4	99	100	100	100	0.916	0.928	0.918	0.915	82	83	81	80	0.045	0.041	0.048	0.049
L.S.D. 5%	0.64				0.008				0.91				0.003			
	2006/ 2007				2006/ 2007				2006/ 2007				2006/ 2007			
	V1	V2	V3	V4	V1	V2	V3	V4	V1	V2	V3	V4	V1	V2	V3	V4
H1	93	94	93	92	0.728	0.738	0.715	0.725	76	78	78	77	0.060	0.054	0.060	0.071
H2	97	99	98	98	0.905	0.918	0.913	0.918	78	79	78	78	0.053	0.050	0.056	0.058
H3	99	100	99	99	0.917	0.933	0.923	0.923	80	82	79	79	0.052	0.050	0.050	0.055
H4	98	100	100	100	0.914	0.925	0.910	0.913	82	83	80	80	0.041	0.038	0.041	0.047
L.S.D. 5%			0.61			0.008				0.86				0.003		

H1, H2, H3, and H4 = 50, 60, 70 and 80 days after 50% heading
V1= Sakha 93, V2= Giza 168, V3= Gemmiza 9 and V4= Gemmiza 10

v- Correlation coefficient:

Table (8) shows the correlation coefficient between moisture content, 1000- grains weight, grain yield, germination percentage, germination rate, seedlings vigor traits, germination after aging and electrical conductivity with harvesting dates. There were positively and highly significantly correlation for 1000- grains weight (r=0.721), grain yield (r=0.867), germination percentage (r=0.858), germination rate (r=0.773), germination after seed aging (r=806), plumule length (r=0.529), radical length (r= 0.648), seedling

dry weight (r= 0.677) and seedling vigour index (r= 0.781) with harvesting dates. On the contrast, there were negatively and highly significantly correlation for seed moisture content (r= -0.921) and electrical conductivity (r=-0.833).

Table (7): Effect of interaction between harvesting dates and wheat varieties on plumule length, radical length, seedling dry weight and seedling vigour index in 2005/ 2006 and 2006/ 2007 seasons.

	Plumule length (cm)				Radical length (cm)				Seedling dry weight (gm)				Seedling vigour index			
	2005/ 2006				2005/ 2006				2005/ 2006				2005/ 2006			
	V1	V2	V3	V4	V1	V2	V3	V4	V1	V2	V3	V4	V1	V2	V3	V4
H1	5.35	5.88	6.35	5.75	5.93	6.28	6.05	5.93	0.601	0.670	0.640	0.617	55.89	63.32	59.83	57.38
H2	5.58	6.00	6.18	5.88	6.03	6.88	6.43	6.20	0.627	0.681	0.685	0.660	61.45	67.42	67.13	64.68
H3	5.65	6.33	6.43	6.13	6.20	6.58	6.85	6.50	0.652	0.690	0.712	0.695	64.93	68.83	70.78	68.51
H4	3.93	6.53	6.78	6.30	6.50	6.78	7.13	6.55	0.657	0.689	0.716	0.692	65.04	68.85	70.95	68.85
L.S.D. 5%	0.12				0.14				.017				1.70			
	2006/ 2007				2006/ 2007				2006/ 2007				2006/ 2007			
	V1	V2	V3	V4	V1	V2	V3	V4	V1	V2	V3	V4	V1	V2	V3	V4
H1	5.25	5.20	6.08	5.73	5.75	6.13	6.50	5.88	0.589	0.657	0.631	0.605	56.84	64.39	61.84	58.69
H2	5.30	5.43	6.18	6.00	5.85	6.18	6.93	6.43	0.616	0.668	0.675	0.647	59.75	65.80	66.20	63.24
H3	5.55	5.93	6.10	6.15	6.13	6.48	6.80	6.60	0.649	0.684	0.702	0.687	63.98	68.06	69.54	68.01
H4	5.73	6.35	6.35	6.23	6.40	6.48	7.47	6.65	0.651	0.685	0.703	0.692	63.96	68.33	69.90	68.81
L.S.D. 5%		0.18				0.33				0.016				1.67		

H1, H2, H3, and H4 = 50, 60, 70 and 80 days after 50% heading
V1= Sakha 93, V2= Giza 168, V3= Gemmiza 9 and V4= Gemmiza 10

Table (8): Correlation coefficient of harvesting dates with the Studied traits.

Character	Harvesting dates
1- Moisture content (%)	-0.921**
2- 1000- grains weight (g)	0.721**
3- Grain yield (ardab/ feddan)	0.867**
4- Germination percentage	0.858**
5- Germination rate	0.773**
6- Germination after seed aging	0.806**
7- Electrical conductivity *(umohs/g seed*)	-0.833**
8- Plumule length (cm)	0.529**
9- Radical length (cm)	0.648**
10- Seedling dry weight (g)	0.677**
11- Seedling vigor index	0.781**

Positively and negatively correlations between Harvesting dates and these results are in the same line with those obtained by Ray and Gupta (1980) and Mersal (2005). From this study we noticed that, at the earliest harvesting date (50 days after heading) seed moisture content arranged between (39.95 and 40.10%) and weight of 1000 seed, yield and seed vigor were less than the other harvesting dates (60, 70 and 80 days after heading)

while wheat seed doesn't reach to the full maturity . Meanwhile at harvesting dates (60, 70 and 80 days after heading) seed moister content decrease and arranged between (19.82 and 10.79%) and weight of 1000 seed, yield and seed vigor traits increased while wheat seed reached to the full and physiological maturity . These agreement with Qun et al., (2007) while they defined the physiological maturity of the seed at harvest, as the time enough for seeds to reach its maximum dry weight and its one of the factors that influence the vigor of any seed lot.

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العلاقة بين مواعيد الحصاد، المحصول وجودة التقاوي في بعض أصناف القمح

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تهدف هذة الدراسة الي دراسة العلاقة بين مواعيد الحصاد (بعد ٥٠، ٦٠، ٧٠، ٨٠ يوم بعد ٥٠ % من الطرد) ومحصول الحبوب وجودة التقاوى لأربعة أصناف من القمح و هي (سخا ٩٣، جيزة ١٦٨، جميزة ٩، جميزة ١٠). أجريت تجربتين حقليتين بمحطة البحوث الزراعية بتاج العز موسمي ٢٠٠٦/٢٠٠٥ , ٢٠٠٧/٢٠٠٦ و صممت التجربة الحقلية في قطع منشقة مرة واحدة في ثلاث مكررات.

وتتلخص أهم النتائج كما يلي

- أدت زيادة فترات الحصاد من ٥٠ الي ٧٠ بعد من ٥٠ % من الطرد إلي زيادة تدريجية في محصول الحبوب (٢٠,٩٧، ٢١,٠٨ أردب/ الفدان)، وزن الألف حبة ، معدل الانبات ، الوزن الجاف للبادرة ودليل قوة البادرة خلال الموسمين. في حين تأخير ميعاد الحصاد حتي ٨٠ يوم من ٥٠ % من الطرد أدي الي تناقص هذة الصفات حيث نقص المحصول بنسبة (3.91، ٥,٠٨ % أردب/ الفدان) خلال الموسمين.
- تأخير ميعاد الحصاد حتي ٨٠ يوم بعد ٥٠ % من الطرد أدي الي زيادة كل من نسبة الانبات (٩٩ %)، طول الريشة والجذير تحت ظروف المعمل ومحتوى البذور من البروتين . فى حين نقصت نسبة الرطوبة بالبذور عند الحصاد ومحتوى البذور من الكربوهيدرات ودرجة اليوصيل الكهربى لمنقوع البذور خلال الموسمين مقارنة بمواعيد الحصاد الأخرى.
- اختلفت الأصناف فيما بينها في معظم الصفات المدروسة وقد سحل الصنف جيزة ١٦٨ أعلى القيم محصول الحبوب (١٨,٩٠، ١٨,٦٢ أردب/ الفدان)، وزن الألف حبة، محتوى البذور من البروتين نسبة الانبات ، معدل الانبات ، أختبار التدهور وأقل قيمة لدرجة اليوصيل الكهربى لمنقوع البذور. بينما سحل الصنف جميزة ٩ أعلى القيم في محتوى البذور من الكربوهيدرات، طول الريشة والجذير، الوزن الجاف للبادرة ودليل قوة البادرة خلال الموسمين مقارنة بباقي الأصناف.
- كان التفاعل بين عوامل الدراسة معنويا على معظم الصفات المدروسة. وقد لوحظ أنة تحت ظروف الحصاد بعد ٧٠ يوم من ٥٠ % من الطرد سحل الصنف جيزة ١٦٨ أعلى القيم وزن ألف حبة، معدل الانبات ومحصول حبوب، محتوى البذور من البروتين في حين تفوق الصنف جميزة ٩ في طول الريشة والجزير، الوزن الجاف للبادرة ودليل قوة البادرة مقارنة مع باقي الأصناف الأخرى في كلا موسمي الدراسة
- أوضحت النتائج وجود ارتباط معنوي موجب بين كل من مواعيد الحصاد و محصول الحبوب ومعظم الصفات المدروسة فيما عدا محتوي الحبوب من الرطوبة ودرجة اليوصيل الكهربى لمنقوع البذور حيث وجد ارتباط معنوي سالب. وتوصي الدراسة بامكانية حصاد تقاوي القمح بعد ٦٠ الى ٧٠ يوم من ٥٠ % من الطرد مع الحصول علي محصول عالى و تقاوي عالية الجودة.