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Studying the Effect of Cultivation Date and Seed Amount on Agronomical Traits, Functional Components and Seed Function of Wheat Items

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Abstract: In order to investigate the effect of cultivation date and plant congestion on agronomical traits, functional components and seed function of two wheat items, this study was carried out at Agricultural Research Center and Natural Resources of Moghan by two times divided patches in the form of randomized complete blocks in four repetitions. Four dates of cultivation, 6th November, 12th November, 6th December, 12th December in main patches and two wheat items named, Moghan and Arta in subsidiary patches and four congestions of 300, 350, 400, 450 grains per square meter in subsidiary patches were located. The results of the tests showed that with a delay on cultivation, growing time, plant height, palmates number, spike long, seed function and biological function had a meaningful reduction. From statistical point of view the effect of studied congestions on seed function was not meaningful. Also from seed function point of view the studied wheat items were in the same statistical group. The reciprocal effect of cultivation date and congestion was meaningful on seed function and in 12th December of cultivation date, the congestion of 450 seeds per square meter had superiority to the three other congestions. All in all, it is recommended that in Moghan and similar climate regions the cultivation date of wheat should be done from 6th November to 15th December with congestion of 300-400 grains per square meter and in delay condition Moghan item should be cultivated.

Key words: Cultivation date · Seed congestion · Wheat items and seed function

INTRODUCTION

Increasing the production of wheat, by optimized using of resources like chemical fertilizers, organic fertilizers, proper irrigation, controlling the decreasing factors of the crop such as, weeds, diseases and suitable management including preparation of the field, proper date of cultivation and also optimized congestion, is feasible [1]. Determining the optimized cultivation date, is determining the time that all of the dominant environmental factors of that time are suitable for germination, growing, stability and plant remaining, in such a way that a farmed plant must be in a health condition and avoid from a harmful growing condition every time [2]. One of the most important of growing management factors is cultivation time. Early cultivation in areas with limited humid soil causes to evacuate soil humidity and perhaps in spring plant growing will face with humidity shortage [3]. And also early cultivation causes that plant cold need be solved soon and plant in late winter leads to stalk which causes plant damage. Early cultivation is along with generating more palmates in each plant which these palmates compete with each other and leads to water and food elements evacuation and perhaps the farmed plant will face with sources shortage [4] and also early cultivation can lead to root disease. On the other hand late cultivation of wheat can cause to decrease the needed time of growing of the palmates which causes to low generation of spikes. With a delay on cultivation, plant growing will be faced with temperature regimen and different day length. The time distance between the advent of the two successive leaves (Phyllochorn) will decre4ase in them and small leaves will appear, so we will need more plants on surface level in order to reform the number of palmates [1]. The fit accumulation of wheat is also one of the other effective factors in optimized function of the plant. In a fit accumulation condition, all of the environmental factors are used completely and in and out plant competition will be in ow rate [5]. Plant number on surface level depends on the seed amount, germination capability and stability and remaining of the small plants [6]. Perhaps plant number on surface level without

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affecting the farming plant it changes a lot which this issue is related to the germination feature of wheat [7]. The reaction of function component of seed to plant accumulation differs and to some extent has redressing feature [1]. Number of spikes on surface level increases by plant congestion and whereas grains number decreases [8]. Decreasing the number of grains in spikes in high congestion is because of inner plant competition and increasing growing level [2]. Stoper and Fisher [9] reported that with increasing of every 100 spikes in one square meter more than optimized congestion, the number of grains in every spike decrease between 3.9 to 7.1. The weight of each seed is of stable components of seed [10]. This issue dependent on the seed type and environmental conditions show different reactions. But in most of the cases seed weight changes are not meaningful [11]. Bakhshandeh and Rahnama [12] studied and reported the effect of three dates of cultivation in Khuzestan, among the treatments of date cultivation and from seed functional point of view meaningful different was not perceived but by increasing of congestion seed function increased, too. Momtazi and Imam [5] in an experiment about the investigation of three date of cultivation (6^{th} November, 15^{th} December, 15^{th} Day) and four types of plant congestion (350, 250, 150, 450 plants per square meter) about the winter function and components of Shiraz type seed in Bajgah a zone in Shiraz province showed that the 15^{th} December date of cultivation with 350 seed per square meter had the best efficiency among them. In this test at the first date of cultivation because of flowering time with low temperature, small flowers insemination did not occur properly and seed number in each spike had a meaningful reduction.

This study was done in according to lots of changes of date cultivation and plant congestion in wheat cultivation by the local farmers and lack of proper information about suitable date of cultivation and optimized congestion on surface level about the studied types in Moghan and similar areas. The goal of the present research is to study the effect of cultivation date and different congestion of plants seed functional components.

MATERIALS AND METHODS

This research was held at agricultural research center and natural resources of Ardabil (Moghan) located in 12 kilometers distance of Parsabad. Moghan is located in39 latitude and 39 minutes of north and 47 longitude and 48 minutes of east and in 60 meters latitude. The study was done by two times divided patches in the form of randomized complete blocks in four repetitions. Four dates of cultivation, 6^{th} November, 12^{th} November, 15^{th} December, 30^{th} December in main patches and two wheat items named, Moghan and Arta in subsidiary patches and four congestions of 300, 350, 400, 450 grains per square meter in subsidiary patches were located. The research land was fallow one year before the research. After land plowing and grading in early fall and after taking samples of the soil and analyzing them, about150 kg ammonium phosphate fertilizer (46% phosphorus &18% Nitrogen) per hectare as a base and 200 kg urea (46% nitrogen) in three times (cultivation, palmate growing and stalk germination) were consumed. To control the wide and thin leaf weeds we used Granstar about 20 grams and Typik about 1 kilogram per hectare before stalk germination level. The cultivation was by stream and heap with 60 centimeter distance in lines with 5 meters long by 3 lines of cultivation on each heap with line distance of 20 cm by using seed machine the test of grains was done. Every subsidiary patch consisted of two heaps and 6 lines of cultivation. The first irrigation was done after cultivation and next irrigations were done according to the needs of the plants. To determine casework plant congestion the distance of cultivation lines considered as a fix distance and seed amount on the lines was changed. In order to reach to each special congestion the needed amount of seed was counted by name power and then entered to the tan of the machine. During growing season necessary notes were taken that involved date of spike advent, flowering and physiologic ripeness. To measure agronomical features and functional components such as, plant long, palmate number, number of fertilized palmate, pedankle length, spike length and number of small spikes of 10 plants were selected by random from every subsidiary patch and their features were scaled. The weight of each seed was scaled by sampling from every seed of the patches and then counting the number of grains by the machine and then by weighting. Measuring the function was done from 4 middle lines of the subsidiary patches after deleting the redundant parts of 4 square meters. The biologic function of was performed by pruning the plants in 0ne square meter from the subsidiary patches and then the plants were kept in special place in 75 centigrade for 48 hours. The index of harvest after separating the grains from the chaffs and scaling them was done by the following formula. Data was analyzed by MSTATC software and averages were compared by Duncan comprehensive test. Also to draw a diagram we used Excel.

RESULTS AND DISCUSSION

The effect of cultivation date on days to flowering and during the growing season was significant at 1% level (Table 1). Delay in sowing of wheat was reduced during the growing period so that the sowing of December 30 to November 6 was reduced by about 33 days (Table 2). Hay (1986) reported the effect of different cultivation dates on wheat growing levels, he said that in spite of different cultivation dates the wheat items in a special time of phonology entered his test with a delay on wheat planting from September 9 to March 9(6 months delay on planting) the plants reached to flowering level just with 16 days delay and distance between cultivation and flowering reduced from 293to 128 days.. The highest plant height (2.101 cm) in the first planting date and its smallest (88 cm) were in the fourth planting dates, respectively. Koshnak [13] stated that with a delay on the planting of May 5 to 31, the height reaches about 6.1 inch. The wheat items had meaningful difference of 1%level about their height (Table 1) and Moghan type with 104 cm height was higher than Arta type. Cultivation on palmate number on 1% level of probability was meaningful (Table 1) and with a delay on planting we perceived a reduction in the features of the plant, in such a way that in 4th cultivation about 3.75 palmates were grown per each plant. Growing of palmate is a biologic attribute, but it is affected by the management of agronomy specially date cultivation and plants congestion. In early cultivations of wheat in fall the plant has a good opportunity for growing of palmates before entering to slow growing of winter, but in late dates of cultivation they have less time for growing in fall [14]. According to Winz [8] delay on planting leads to short during of growing and increasing the speed of growing palmate but eventually the number of palmate is decreased. In this experiment the effect of plant congestion on palmate number on probability level of 5% was meaningful (Table 2). And with an increase in congestion of 300 grains per square meter to 450 grains per square meter, palmate number decreased from 4.16 to 3.74 in each plant (Table 2).

By delaying planting the number of fertile palmates decreased in each plant (Table 2). So in the 4th date of planting was the least number (2.98 fertile palmtaes). Number of small spikes on the surface level is a feature that is determined by the fertile palmates. Temperature decrease in palmate growing time in fall and also decrease

Table 1: Varince analysis of agronomical traits, functional components, biologic and seed function of wheat items

		MS											
SOV	df	Days to heading	Growth period	Plant height	Total tillers	Fertile tillers	Peduncle length	Spike length	1000 grains weight	Grains per spike	Yield	Biological yield	Harvest index
Rep	2	198.50	195.63	17.61	7.66**	6.55**	7.69	0.29	5.99	53.36	5983	117841	0.001
Planting date	3	1870.88**	5136**	876.56**	1.44*	1.19*	10.36*	3.15*	25.68*	216.12*	659472099	134001787	0.008**
Error 1	6	166.05	155.02	15.281	0.39	0.21	4.3	0.42	5.03	64.64	51290	7628853	0.001
Genotype	1	2.67	0.01**	5113.38**	0.05	0.09	1.77	45.33**	103.39	831.31**	1708	56059260	0.035**
P×G	3	2.66	2.89	26.09	1.35	0.66	41.41**	0.81	9.25	66.21	2107695*	8499468	0.003**
Error 2	8	3.16	8.05	17.630	0.38	0.34	3.82	0.31	4.48	59.43	5537775	7510829	0.002
Density	3	0.056	2.122	13.16	0.81*	0.54	0.89	0.48*	7.17	148.12*	345341*	6279957	0.001
P×D	9	0.056	2.381	11.47	0.5	0.53	3.18	0.47**	5.06	95.77	317150*	3412366*	0.003
G×D	3	0.056	2.38	11.47	0.5	0.53	3.18	0.47**	5.06	95.77	317180*	3412366*	0.003
G×P×D	9	0.056	1.53	16.47	0.23	0.05	1.76	0.15	6.65	59.58	253523*	4247616	0.001
Error 3	48	0.056	2.906	6.38	0.30	0.41	2.35	0.14	3.65	53.47	113741	1941427	0.001
CV(%)	-	9.8	6.5	9.6	7.9	8.48	6.2	10.4	3.61	14.9	4.76	8.65	6.2

Table 2: Comparison among agronomical traits, functional components, biologic and seed function of wheat items

Treatments	Days to heading	Growth period	Plant height	Total tillers	Fertile tillers	Peduncle length	Spike length	1000 grains weight	Grains per spike	Yield	Biological yield	Harvest index
Planting dates												
6th November	163.7a	214.1a	101.2a	4.16a	3.24ab	14.43ab	9.57a	43.0a	39.83b	7397a	18260b	0.36b
12th November	157.7ab	207.1a	100.4a	4.03a	3.48a	14.93a	9.16ab	42.8ab	40.41ab	7131b	19040a	0.37b
6th December	150.3bc	194.8b	97.1b	4.10a	3.42a	14.12ab	8.71b	42.5b	40.70ab	7469a	18870a	0.37b
12th December	143.3c	180.8c	88.0c	3.75a	2.98b	13.36b	8.97b	39.0c	46.27a	6325c	179600a	0.40a
Genotypes												
Moghan-3	153.58a	199.18a	103.97a	3.98a	3.24a	14.34a	7.79a	45.1a	44.47a	7084a	17768b	0.39a
Arta	153.91a	199.20a	89.37b	4.03a	3.30a	14.07a	8.41b	40.4b	38.86b	7076a	19296a	0.36b
Density												
300	153.7a	199.5a	97.63ab	4.16a	3.39a	13.98a	9.26a	44.2a	45.05a	6994a	18260b	0.38a
350	153.7a	198.9a	97.360a	4.02a	3.30a	14.15a	9.10ab	43.7a	42.43ab	71710a	19040a	0.38a
400	153.8a	199.3a	97.13ab	4.10a	3.37a	14.42a	9.12ab	42.9a	40.04ab	7131a	18870a	0.37a
450	153.8a	199.0a	95.65b	3.74b	3.06a	14.28a	8.93b	42.8a	39.69b	7114a	17960b	0.37b

The values in every group and column, which at least have the same letter in common, have not significant statistical difference according to Duncan Multiple rang test [4]

in exposure to the sun in delayed plantings decreased the fertile palmatesp. Titry *et al.* [15] perceived that with a delay on wheat planting in fall from September to November, the number of fertile palmates decreased from 281 to 91/m^2. Perhaps the reason for slam number of pamlates was plant quick growing and reduction of time about each growing level. This issue decreases leaves number, palmate number and finally the number of small spikes on surface level. Tillers per plant decreased (Table 2), so the planting date to the fourth lowest number (98.2 fertile tillers) of each plant was Ozzy. The number of spikes per unit area is a trait that is Barvrtyyn by the number of tillers. Barvraz 281 tillers per square meter was reduced to 91. Probably because of reduced number of fertile tillers due to delayed planting and crop development accelerated during the period of each plant is growing. This reduces the number of leaves, tillers and number of spikes per unit surface 4.4 spikes on each plant. The effect of planting date and seed density on seed number per spike was significant at 5% probability level (Table 1). Delay in planting with seed number per spike increased. Anderson and Smith [16] also reported that early sowing of wheat is less number of grains per spike. Florets and thus reduce the number of grains per spike. Considering that the density increased, plant growth rate increases. Can be predicted that with increasing density and decreased during the beginning of spikelets per spike in growth is not enough.

The effect of planting date on grain weight was significant at 5% probability level (Table 1). Between planting dates in the history of the first highest seed weight (43 g) and the lowest since the fourth seed weight (39g) (Table 2). Delay planting of wheat seed weight significantly decreased anderson and Smith [16] also observed that the delay in wheat sowing significantly decreased seed weight. By increasing the congestion of plants (bushes), the number of produced fertile palmate in each bush has decreased. and it has decreased from 3.39 in 300 seed congestion per square meter to 3.06 in 450 seed congestion per square meter (Table 2). Number of spikes in low congestion areas is high but by in creasing the congestion of bushes per unit of surface, the number of spikes in bushes decreases because of competition between bushes, shortage of penetration of light into plants and also speeding of plant growth period [17]. Corney and heagarty [4] reported that planting date and congestion of seed in barley plant and they showed that there were only one spike on average in 1116 bushes congestion per square meter .while this trait 4.4 spikes in each bush for 186 bushes congestion per square meter. Sowing date effect and congestion of seed per the number of in each spike in surface was probably 5% meaningful (Table 1). By delaying the date of sowing the number of grains has increased in each spike. Anderson and Smith [16] also reported that there were low seeds per spike when it is planted early. Navabi and Zolghadr [18] also reported similar result in barley. By considering the fact that the optimal temperature is 76_20 to flower and polinatation and inoculate for wheat [10], there for, when pollination time is simultaneous with low weather temperature in Moghan region can lead to decrease in blossom fertility and in consequence, can result in low seeds in each spike by increasing congestion, the number of grains in each spike decreased, as a result, it decreased from 45 in 300 - grains per square meter of 39.7 in 450 bushes congestion per square meter (Table 2). Teach and Smid [19] also observed that by increasing congestion from 88 to 116 bushes per square meter, the number of grains have decrease from 36 to 28 grains per spike.

Considering that by increasing congestion, the plant growth speed increases we can estimate that by increasing congestion, spike initiation period length will derease and as a result, spike will not have enough growth. Sowing date effect on weight of one thousnad seed in probable level (surface) was 5% meaningful. (Table 1) among planting dates, the first date was the heaviest thousand - grains (43 g) and date fourth was the lightest thousand - grains (39 g) (Table 2) by delaying at planting wheat, the weight of one thousand - seed had decreased meaning fully anderson and smith [16] also observed that by delaying at sowing what the weight of one thousand seed has meaning fully decreased they concluded that relative importance of thousand seed weight as a main factor in increasing low-foot item seed performance, when the planting date is delayed, is high. Seed weight reduction is related to condition and offer-flowering period length that is in early seed planting date, plants initiate flowering period early and as a consequence the seed filling period increased and it makes the grains to be filled fully and causes increase in thousand seed weight . But in delayed planting date. Because of shortening of seed filling period length and increase in weather temperature in this period and growth step seed, grains did not have enough time to be filled. For high temperature on thousand seed weight was not meaningful statistically (Table 1). Though increase in the number of spikes at high congestion bushes and increase in competition among spikes caused limitation in source amount to each destination unit and in high congestion bushes. According to Corney and Hegerti's [4] increase in

bush congestion in delayed planting date caused seed performance increasing. According to their advise we can use this effect and trait to pay for decrease in delayed seed planting performance. I sum the present research showed that the cultivation date of 6th November to 15th December with congestion of 300 to 400 grains per meter square is the best method in Moghan and other similar areas. And with a delay on cultivation, Moghan type is suggested. Also about delayed date of cultivations it is better to increase the congestion up to 450 grains per square which can reform the adverse effects of delayed cultivation to some extent.

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