Effect of K, P, Zn, S Fertilizer on cold tolerance on rapeseed genotypes (relay Cropping) in climatic region of Varamin

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Abstract: In order to study of different levels of fertilizer treatment (K , Zn, S) on increase tolerance to cold on quality characteristics on genotypes of rapeseed in delayed planting , an investigation was carried out with factorial in random complete block with three replications and 36 treatment ,in Varamin - Pishva university field research (Ghaleh – sin) in 2008-2009. Factors were genotypes in three levels(Hyola -42 , SLM046 , Zarfam) and fertilizer treatment in 4 levels (1-Control , 2– C+ K, 3- C, K+Zn, 4- C, K, Zn +S). Planted seed at 10th November were delayed planting .The highest grain yield achieved from (C,K,Zn,S,SLM046)with 6564.6 Kg/ha ,That had 72 % grain yield further of (Control, Zarfam) genotype with 1807.65 Kg/ha. Also the highest number of pods per plant, number of grain per pods and biological yield with 156.97, 20.7 and 17384.9 Kg/ha respectively was obtained from Hyola-42 Hybrid and use of C, K, Zn, S. In this research the lowest these amounts were achieved for Zarfam genotype with Control fertilizer. In conclusion Slm046 genotype with C, K, Zn, S fertilizers was suitable for delayed planting (Cold Stress) for Varamin condition.

[Pourang kasraie, Mohammad Nasri, Mansoureh Khalatbari. Effect of K, P, Zn, S Fertilizer on cold tolerance on rapeseed genotypes (relay Cropping) in climatic region of Varamin**.** Journal of American Science 2011;7(6):386-390]. (ISSN: 1545-1003). http://www.americanscience.org.

Keywords: Rapeseed; Genotype; yield and yield components cold tolerance

Introduction

Considering the high cold tolerance in canola and desirable agronomic traits, using side products and the high percentage of oils such as canola cultivation is the most important benefits that can be placed in rotation with cereals.

Adequate to cover the field and appropriate growth and increased tolerance to cold, canola should be grown on suitable planting, in general, canola should be six weeks before the first frost. Planting In the late fall, often resulting in increased seedling departure time due to reduced soil temperatures and reducing withdrawal and seedling cold damage (Starner et al., 2002).

In most cases what the delay in planting in the spring and in autumn will reduce performance. Combined with accelerated development by reducing plant growth after flowering (especially in late genotypes clay) is the main cause of yield loss (Mendham et al., 1995). In a research, with three genotypes of Canola Okapi, Orient, Colvert, the four planting dates (15th September, 25th September, 4th October and 14th October) at the research station, Miami and Florida was about concluded that planting on September 15 and 25 significant difference in terms of yield are not, while planting on October 14 produced the lowest yield (Afridi et al., 2002). Habekotte (2003) in the adaptation and comparison of quantitative and qualitative characteristics of 11 genotypes of autumn-type rapeseed genotypes were the result of two genotypes Zarfam zero tolerance to cold and maximum grain weight is greatest and most seed oil to genotype Yantar Most growth and oil yield was related to genotype SLM046 (Gupta and Daws, 2008).

Mendham (1995) concluded that late planting dates before flowering time to receive radiation and there is a growing shortage of lower saddlebag number per square meter through more number of seeds per pod greater amount of compensation and performance.

In a study on determining the best planting date in the three species B. Rape, B. Juncea, B. Carinata was announced that delays in planting can make the required amount of heat (GDD) in the plant growth period to reach needs to be reduced, but the number of days elapsed, the total increase (Mulkurasi, 2006). Mendham and Scott (1995) showed that early planting dates, and grain losses portmanteau of lower canopy layers are more, but cultures later on, the mortality rate is the same throughout the canopy. Hierarchical arrangement of branches, portmanteau shows that the earlier lower saddlebag on the main stem and branches will be formed first from the standpoint of timing, development and access to material raised leaves, lower stems have the advantage.

Curtis (2006) also believes that potassium no effect on the rate increase hydrocarbon oils and proteins are increased in this way to cold stress tolerance of canola. Sulfur tolerance of plants against environmental stresses and increases in winter rapeseed grown are using sulfur due to long period planting to harvest increased protein yield and seed oil content (Torsswel, 2004). Marschner (2002) believes that rapeseed is taking on increased plant mass and thus be used to increase hydrocarbon production and finally also because increased oil percent increase tolerance to cold stress.

In order to study the compatibility of the modified rapeseed in 24 genotype weather was cold country and slm046 Hyola -42 genotypes respectively 3852 and 3656 kg / hectare produced the highest yield (Grom bacher and Nelson, 2001). Since the units will try to use the maximum agronomic practice in the region comes after Varamin can delay harvest corn planted canola be grown using fertilizer is hoped to be some increase in cold tolerance in canola so that no Canola yield reduction, efficient use of farm land, the following research aim was to achieve such a major.

Material and Methods

To investigate the effect of potassium fertilizer, sulfur and zinc on quantitative characteristic on early planted canola, as a factorial experiment in randomized complete block design in three replications third decade of November 88-87 did at the farming year in the Agricultural Research Station Varamin. Experiment location, geographic coordinates of 39 and 51 and 19 along the east, 35 north latitude and altitude of 1000 meters above sea level is located in the experimental treatments included: genotype 1-Hyola-42 2 - Slm046 3 - Zarfam and second treatment Fertilizer: 1 - control (N + P) 2 - control + potassium sulfate 3 - Control + potassium sulfate + zinc sulfate II 4- control + potassium sulfate + zinc sulfate II + sulfur treatments. Treated fertilizers were selected according to soil test results. 200 kg/ ha urea, 50 kg/ ha triple superphosphate and 50 kg /ha potassium sulfate and 25 kg ha zinc sulfate and 30 kg ha sulfur were used. All fertilizer and 1.3 Nitrogen were used at planting and the other Nitrogen in two ways at the stage of rapid growth and stem elongation in spring. Each replicate included 12 treatments and each treatment consisted of nine lines. Fight weeds manually in the third decade of April and early May 1388 was done to combat the toxin Mtasystoks cabbage aphid wax ratio 1.5 was used in thousands. At physiological maturity used to determine yield components of five plant randomly selected in each treatment plant that the number saddlebag. To determine the yield: portmanteau of each plot area 3.20 m2 18 June 1388 harvest. For final drying and the humidity reaching 12 percent for one week and put in the air then manually separate seeds from the wallet and the seeds were harvested separately every plot with accurate laboratory scales and weighing data had been extended to the whole performance. The end of the experiment, the results of each of the characters, after expansion to hectar and with the help of computer software SAS (9) analysis of variance and comparison of data were drawn with the help Duncan test at 1 and 5 percent was conducted by the computer program Excel charts.

Results and Discussion

Number of silique per plant based on data from this study on the interaction effects and simple, and fertilizer treatments on the number of genotypes in plant satchel at 5 and 1 percent was significant. Treatment A2B4 (SLM046, C, K, Zn, S) with 156.7 numbers, highest levels and treatment A3B1 with 94.3 numbers lowest to allocated. Corelation line has been reported between the numbers portmanteau plant dry matter production and cumulative to the end B.napus L. flowering species (Habekotte, 2003). So it seems that cold stress on photosynthesis compared with restricting the number of actual satchel reduces potential. Perhaps this ratio index, influenced by the amount of stress Submit product on the plant. In this study, using oligo-elements and element sulfur, potassium, zinc and increased grain stored hydrocarbons in the synthesis of proteins that share the pollen tube and cause the storage protein is a member of the leading to increase pollination and fruit set is more seeds (Marschner, 2002).

Table 1. Analysis of variance of yield component as affected by Genotype and fertilizer treatment in rapeseed

S.O.V	df	No.ofsilique per plant	No.of grain per siliqe	1000grain weight(g)
Replication	2	3.02 ns	25.81 *	0.021 ns
Genotype	2	101.41 **	918.25 **	6.08 *
Fertility	3	89.52 **	654.03 **	9.41 *
Genotype*Fertility	6	221.48 **	384.41 **	13.25 **

**Significant difference (α=1%), *significant difference (α=5%), ns: No significant difference

Total grain satchel data showed that genetic differences between genotypes in terms of seeds per genotype SLM046 satchel is delayed planting conditions could produce 18.1 the number of seeds the best rates from the wallet to its genotype and Zarfam 14.7 minimum number of seeds in the wallet. Fertilizer treatments also caused changes 26.3 percent in the trait and the number 14 in the control treatment to 19 the number increased in the treated B4. The interaction between the genotype and fertilizer treatments on the number of seeds in the satchel was a significant level of 1 percent. Satchel of seeds per 11.8 numbers in the treatment A3B1 20.7 reached the number in treatment A2B4 genotype and fertilizer treatments affected about 43 percentage. Feeding Canola zinc, is due to increased hydrocarbon stored pollen, pollen longevity increases and the resulting increase in pollen grains and the formation of more wallet (Sharma et al., 1999). Any factor that increases the dry weight during the growth period is like planting date and the elements, number of seeds increases the saddlebag. Mendham (1995) concluded that late planting dates before flowering time to receive radiation and there is a growing shortage of lower saddlebag number per square meter through more number of seeds per pod to get some extra compensation and performance.

Table 2. Means comparison of yield component as effected by Genotype and fertilizer treatment in rapeseed

Treatment	No. of silique per plant	No .of grain per silique	1000grain weight(g)
Hyola-42 (A1)	132.85 a	16.7 ab	3.7 a
SLM046 (A2)	140.17 a	18.1 a	3.6 a
Zarfam (A3)	112.7 b	14.7 b	3.38 b
C (B1)	112.4 b	14 c	3.42 b
C, K (B2)	122.7 b	15.5 c	3.52 b
C,K,Zn (B3)	134.8 ab	17.5 b	3.59 ab
C,K,Zn,S (B4)	145.1 a	19 a	3.69 a

Means with the same letter in each column have not statistically significant difference

The study treated A2B4 (C, K, Zn, S, SLM046) than treatment A3B1 (Zarfam, C) superior 35.2 had shown that the effect of the elements used on rapeseed genotypes that could have negative effects that cause planting delays rapeseed plants weaken and fall due to reaching the appropriate LAI able to produce enough sap to fill the raised beads formed, especially in the seeds on the wallet is not sub-branches. The interaction was significant between genotype and fertilizer treatments on grain weight at α=1%. A1B4 treated with the highest average amount of 3.8 g and the lowest average 3.18 g was obtained from A3B1 treatment.

Table 3. Means comparison of yield components as affected by Genotype and fertilizer treatment in rapeseed

Treatment	No. of silique per plant	No.of grain per siliqe	1000grain weight(g)
Hyola-42*C(A1B1)	117.2 c	14.4 e	3.6 bc
Hyola-42*C,K(A1B2)	125.6 bc	15.9 d	3.68 b
Hyola-42*C,K,Zn(A1B3)	138.4 b	17.6 c	3.71 ab
Hyola-42*C,K,Zn(A1B4)	150.2 ab	18.9 b	3.8 a
Slm046*C (A2B1)	125.6 bc	15.8 d	3.49 cd
Slm046*C,K(A2B2)	134.4 b	17.2 c	3.57 c
Slm046*C,K,Zn(A2B3)	146.4 ab	18.9 b	3.64 bc
Slm046*C,K,Zn,S(A2B4)	156.7 a	20.7 a	3.7 ab
Zarfam*C(A1B1)	94.3 d	11.8 f	3.18 f
Zarfam*C,K(A3B2)	108.2 cd	13.4 e	3.31 e
Zarfam* C,K,Zn(A3B3)	119.7 c	15.9 d	3.44 d
Zarfam* C,K,Zn,S(A3B4)	128.5 bc	17.6 c	3.58 bc

Means with the same letter in each column have not statistically significant difference

Mulkurasi (2006) reported that planting later than the deadline, number of seeds per plant decreased and increased grain weight plant is canola seed weight, but this increase has not been able to reduce other components of grain yield to compensate, also increases the duration between increased germination to flowering. In the present study with genotype Hayvla -42 SLM046 Zarfam to excellence has been treated using elements of potas, zinc and sulfur content increases in leaf and stem carbohydrates during the formation of which appear to be portmanteau facilitate the flow carbohydrates to the reproductive organs and ultimately increase product quality seed. This action due to the impact on various stages and elements mentioned enzymes such as carbonic anhydaz and dhydrvnaz (Tandon, 2001). Therefore able to use these elements much about the negative effects of cold stress to control and prevent severe grain weight. The highest grain weight of the treated was obtained for A1B4 (Hayvla -42; control, potash, zinc and sulfur).

Interaction between genotypes and fertilizer treatments was significant on yield (α=1%) 1807.65 kg per hectare of treated A3B1 to 6579.6 kg per hectare, which was treated A2B4 has increased 72 percent.

Canola yield in fact is balance between vegetative growth and the potential number of flowers and seeds, research shows that low temperatures during flowering through pollen grains thwarting the main factor is to reduce grain products (Torsswel, 2004). To so that the tension during flowering and pollination role are are in distinguishing genotypes of rapeseed yield and yield components (Smith and Gallway, 2008). In order to study the compatibility of the modified rapeseed in 24 genotype weather was cold country and SLM046 Hyola -42 genotypes respectively 3852 and 3656 kg per hectare produced the highest yield (Tandon, 2001).

In this study the use of fertilizers, potas, zinc and sulfur increased root growth, the branches and eventually (Grewal and Graham. 1997) (Smith and Gallway, 2008). Researchers in their research are showed that taking zinc and other micronutrients is to increase grain yield (Srinivasan and Morgan, 2006). Srinivasan and Morgan (2006) expressed in their reports that the consumption of oligo-elements before planting, the yield increases to 56 %. Sulfur used with nitrogen, phosphorus and potassium increased yield to 51.3%.

Table 4. Analysis of variance of yield and HI as affected by Genotype and fertilizer treatment in rapeseed

S.O.V	df	Grain yield(Kg/ha)	Biological Yield(Kg/ha)	HI (%)
Replication	2	12.85 ns	9.45 ns	6.48 ns
Genotype	2	254648.2 **	334417.2 **	1845.3*
Fertility	3	195521.6 **	195673.6 **	1492.01 *
Genotype*Fertility	6	408092.5 **	250426.5**	23814.8 **

**Significant difference (α=1%), * significant difference (α=5%), ns: No significant difference

Performance of biological functions biologically from 8420.6 kg per hectare in genotype Zarfam to 13063 kg per hectare in genotype SLM046 hit. Fertilizer treatments had significant effect on yield biologically and biological yield from 7198.8 kg per hectare in the control treatment reached to 14405.9 kg per hectare in the B4 treatment. Curtis(2006) believes that late planting reduced biological function .But the result showed that taking elements such as potash, zinc and sulfur plant height and branch number scheme and eventually saddlebag and ultimately grain yield per plant and biological yield increases and has not killed late than too early influence on biological function.

Table 5. Means comparison of yield and HI as affected by Genotype and fertilizer treatment in rapeseed

Treatment	Grain yield(Kg/ha)	Biological Yield(Kg/ha)	HI (%)
Hyola-42 (A1)	4175.7 b	11034.5 b	37.75 a
SLM046 (A2)	4874.4 a	13063 a	37.12 a
Zarfam (A3)	3000.82 c	8420.6 c	35.42 b
C (B1)	25573d	7198.8 d	35.7 b
C, K (B2)	3491.3 c	9445 c	36.7 ab
C,K,Zn (B3)	4800 b	12307.8 b	37.1 ab
C,K,Zn,S (B4)	5414 a	14405.9 a	37.4 a

Means with the same letter in each column have not statistically significant difference

The interaction was significant between genotype and harvest index of fertilizer treatments on the harvest index at α=1%. A1B4 had the highest harvest index of treatment with 38.1 %, and the lowest harvest index was obtained for A3B1 treatment with 33.9 %. Although SLM046 genotype has the highest biological yield and grain yield, but in terms of harvest index was the second; genotype Hayvla -42 due to less difference between grain yield and biological will be non-Vrs more efficient and effective use of nutrient elements, able, with greater harvest index. In this study, fertilizer quality genotypes and their genetic characteristics, which caused the highest harvest index of treatment A1B4 (-42 Hayvla and control, potash, zinc and sulfur), respectively. Loffe(2008) and the results In this study the delay in planting resulted in a significant reduction in harvest index but Srinivasan and Morgan(2006) stated that the delay in planting no effect on harvest index.

Table 6. Means comparison of yield and HI as affected by Genotype and fertilizer treatment in rapeseed

Treatment	Grain Yield(Kg/ha)	Biological Yield(Kg/ha)	HI (%)
Hyola-42*C(A1B1)	2794.5 f	7469.6 g	37.4 ab
Hyola-42*C,K(A1B2)	3699.7 de	9824.7 e	37.6 ab
Hyola-42*C,K,Zn(A1B3)	4722.2 c	12457.1 c	37.9 a
Hyola-42*C,K,Zn(A1B4)	5486.3 b	14386.7 b	38.1 a
Slm046*C (A2B1)	3129.7 ef	8695.3 f	36 b
Slm046*C,K(A2B2)	4286.6 cd	11473.8 d	37.3 ab
Slm046*C,K,Zn(A2B3)	5501.7 b	14698.1 b	37.4 ab
Slm046*C,K,Zn,S(A2B4)	6579.6 a	17384.9 a	37.8 a
Zarfam*C(A1B1)	1807.65 g	5431.7 h	33.9 c
Zarfam*C,K(A3B2)	2487.5 f	7036.5 g	36.7 b
Zarfam* C,K,Zn(A3B3)	3531.9 e	9768.2 e	37.1 ab
Zarfam* C,K,Zn,S(A3B4)	4176.1 d	11446.1 d	37.4 ab

Means with the same letter in each column have not statistically significant difference

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5/12/2011