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ORIGINAL ARTICLE

Effect of Different Intensities Water Deficit Stress on Some of Agronomical Characteristics of Autumn Rapeseed Cultivars (*Brassica napus L.*)

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Hossein Bagheri and Amir Hossein Shirani-rad; Effect of Different Intensities Water Deficit Stress on Some of Agronomical Characteristics of Autumn Rapeseed Cultivars (*Brassica napus L.*)

ABSTRACT

drought and opportune water use is too important for water saving and high yield product.to assess the resistance to drought stress of two varieties of autumnal Rapeseed and study the their individual performance, a split plot experiment is carried out in 2005-06 harvest season to execute in farm of Oil-Seed Science, and Breeding Research and Plant Supply Institute, Karaj, Iran, using two treatments and three replicates, in which irrigation remained as the main factor in seven levels and the two secondary factors consisting of Zarfam & Opera varieties. The results reveled that the effect of variety on the seed yield, seed-oil yield, seed-oil percent (1%) and 1000 seed weight (5%) found significant ($P<0.05$). The complimentary effects of irrigation and variety on attributes number of fructify in the secondary branches and the number of seed in fructify also showed a significant ($P<0.05$) impact. Among the studied parameters, the correlation between the seed-oil yield and seed-oil percent was found positive and significant ($P<0.01$) compared to the number of seed in fructify and the maximum correlation was found between seed yield and oil yield ($r = 0.99$).

Key words: *Varieties of Rapeseed, Drought stress, Yield and yield component*

Introduction

One third of the world lands are classified as Arid and Semiarid Region and the remains are faced with water seasonal or local fluctuations (Beweley, and. Krochko.1982). Aridity is the most common environmental stress and approximately include 25% of the world lands [14,22]. Among the most important criteria for genotypes assessment to environmental conditions is study of respective effect of genotype and resistant study of grain operation through non-considerable changes in different environmental conditions.

Amount and velocity transfer of assimilates including plant photosynthesis is depends on plant reverse action and absorption of environmental stimulus, enzyme-hormone and avandi system operation and respective effects of these factors appeared in form of grain filling and velocity and have key role in grain resistance operation [6]. It is apparent that water stress has no considerable effect on grain quality but in flowering time cause for decrease in grain oil contents (Wilcox. and frankenberyer.1987).

The fact that water stress effects on growth and yield are genotype-dependent is well known [3]. Identification of the critical irrigation timing and scheduling of irrigation, based on a time and accuracy to the crop, is the key for conserving water and improving irrigation performance and sustainability of irrigated agriculture [16]. In arid and semi-arid environments, both efficient use of available water and a higher yield and quality of safflower are in demand [10,7,9].

Major part of Canola production in the world are under dry farming conditions and as a result, plant

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reaction to stress is an important topic (Mayers, et al. 1997). Canola may treated by dry farming in those regions which have autumn and spring raining. The plant has no need extra water , but in germination stage, Rosset period, stem elongation, flowering, seed formation and its growth; there is sense of water requirements (Singh *et al*, 1977). Canola is sensitive to drought in time of germination and pod grow. The case being most important when sufficient water is available for commencement of germination and new planted seedling faced with in -sufficiency water. Of course, in Canola cultivation water irrigation may not be used (Mayers, 1997).

B.napus has considerable resistance against aridity which is due to different features including: Root/shoot position; more distribution of plant in comparison with grains and pods after pollination between and inside Canola, specially B.napus as a considerable variance with regard to resistance against aridity such as: Proline accumulation; chlorophyll resistance, and more germination in water stress conditions [11].

Irrigation performance after 50 mm evaporation of Class A in Canola is produce the most grain operation and with increase irrigation period to 100 and 150 mm evaporation of class A, grain operation show meaningful decrease [25]. After Irrigation with 50 mm evaporation in control Class A in Canola, the most production of grain operation is attain and with increase of irrigation to 80 mm evaporation of Class A, grain operation is not receive meaningful decrease but in irrigation of 110 mm of class A; shown meaningful decrease of grain operation regarding control sample [25]. Whereas most part of consumable oil of the company are import from foreign countries, also due to limitations of water resources, the necessity of planting oil seeds have an important features.

The aims of this research were to study the effects of late season drought stress on seed and oil yields and their components, and to evaluate their relationships among Autumn Rapeseed Cultivars.

Material and methods

For appoint of resistance to drought stress two kinds of autumnal rapeseed and survey of component of their function in conditions of treatment for examination drought stress and regular irrigation (control group), examination in case of split plot in form of complete basis project block in three repetitions that which the irrigation was the main factor in seven levels: consist of regular irrigation (control group), cutting irrigation in stage of tillering, cutting irrigation in stage of flowering, cutting irrigation in stage of fructify, cutting irrigation in stage of tillering and flowering, cutting irrigation in stage of tillering and fructify, and cutting irrigation in stage of flowering and fructify and also the accessory factor in two levels consist of Zarfam & Opera varieties. The experiment was carried out at the Seed and Plant Improvement Institute (35°59´N, 50°75´E, and altitude of 151m above the sea level), in Karaj, Iran during 2005-06. This region has a semi-arid climate (230mm annual rainfall) and has a clay loam soil, with montmorillionite clay mineral, low in nitrogen (0.06-0.07%), low in organic matter (0.56-0.60%), and alkaline in reaction, with a pH of 7.9 and Ec=0.66 dS m-1. The soil texture is sandy loam, with 10% of neutralizing substances. In this survey all the stages of plant's phonology and various attributes such as length of the bush, number of the secondary branches in the bush, the sickness of the stem, the length of silique's main stem, secondary branch, the length of the silique, the number of the silique in the main stem and the secondary stem, number of the silique in the bush, the number of seed in the silique in main stem and secondary stem, the number of the seed in the silique, the weight of the thousand of seeds, function of the seed, biologic function of harvest's coefficient and the percentage of oil of the seed and the function of the seed's oil were measured. The experiment was organized in a randomized complete block design, with split plot arrangement, employing three replications. In order to better evaluate and determine the growth characteristics, growth in different treatments and growth analysis were performed. To measure and calculate indexes of growth, from about 4 to 6 leaf stage of plant physiological interval of once every 14 days, all experimental plots, sampling was destructive and leaf dry weight, total plant dry weight and speed plant growth was determined. Data matching statistical models split plot design in randomized complete block design was simple variance analysis and comparison of means using multiple range Duncan test 5% level was performed. The simple correlation between test characteristics was measured.

Results and discussion

The results of analysis of variance showed that cultivar traits such as yield, oil yield, seed oil (1% probability level) and seed weight (5% probability level) were significant. The interaction of irrigation and variety on grain number pod trait significant effect is exhibited (Table 1). The results of the study showed that a simple agronomic traits of 1% probability level on grain yield was significant (Table 2). Mean levels Zarfam Agronomic traitss showed that agronomic traits with the average of 4192 and 3448 kg/ha were maximum and minimum production yield. Comparing different levels of irrigation also showed that grain yield with irrigation conditions in forming stems and flowering stages with mean 4769 kg/ha respectively (Table 3). Water shortages could affect deleterious effects on canola yield, but the effect of genotype and developmental stage of plant adaptation to drought depends. Rapeseed ability to absorb water from the depths of the earth could be considered as an advantage [18].

Simple interaction effects of irrigation and irrigation and variety on grain weight was not significant. While the simple agronomic traits of 5% probability levels were significant. A simple comparison of agronomic traitss revealed the highest seed weight associated with a mean Agronomic traits Zarfam 3/85g respectively. In comparing the interaction of irrigation and genotype was found in drought stress conditions the highest seed weight agronomic traits Zarfam (4g) cutting off the water in step stems forming and flowering found to have the least amount of this trait (3/4g) and stress at flowering stage and was forming stem (Table 3). In the study of physiological drought tolerance in rapeseed, expressed under drought conditions, significant differences in grain weight has been reported [23]. It seems that in this study, pod number per plant with the loss of drought stress, the remaining pod seeds maintain their weight normally. Analysis of variance of seed oil percent depicted in the agronomic traits of 1% level of this trait was significant (Table 2). Also compare the interaction of cultivar and irrigation control irrigation was found that the highest percentage of oil to average Agronomic traits Zarfam 40% and the highest oil content under drought stress conditions Zarfam Agronomic traits (42) with a water cut conditions in flowering stage and pod forming is obtained (Table 3). Drought stress on seed oil content has no significant effect (Munoz and Fernandez, 1998). Analysis of variance in seed number pod showed that the interaction of cultivar and irrigation at 5% this trait were significant (Table 2). Comparison of means of irrigation and cultivar interactions in drought conditions, the highest number of seeds per pod about opera agronomic traitss mean 20 is that the amount of irrigation in the forming stage is derived stem (Table 3). Drought pollination stage and grain filling decrease in canola seeds per pod is (Niknam and Turner, 1999). In the present study the number of seeds per pod of drought (Agronomic traits Opera) has a low above results with the results of such research (Halshem et al., 1998; Niknam and Turner, 1999, [18,24]. Table of simple correlation between traits indicated that the number of seed oil, seed pod and seed oil yield positive and significant correlation in 5% level, and positively correlated with grain yield and level of significance has had a percentage, the seed performance, a significant positive correlation in 1% level seed oil and seed oil yield (Table 4).

Table 1: Irrigation stage and amount of irrigation (m^3)

Irrigation and stress stage	Irrigation phase	Irrigation amount
regular irrigation	8	5120
cutting irrigation in stage of tillering	7	4480
cutting irrigation in stage of flowering	7	4480
cutting irrigation in stage of fructify	7	4480
Cut. Ir. in stage of tillering and flowering	6	3840
Cut. Ir. in stage of tillering and fructify	6	3840
Cut. Ir. in stage of flowering and fructify	6	3840

Table 2: Simple analysis of some trsits of rapeseed cultivars in Karaj area

		(M.S)				
	DF	Grain yield	1000 SW	Oil %	No. of grain in fructify	Oil yield
Rep(R)	2	ns	ns	--	--	--
Irrigation(I)	6	ns	ns	ns	ns	ns
Error(a)	12	--	--	--	--	--
Variety(V)	1	**	0	**	ns	**
V* I	6	ns	ns	ns	0	ns
Error(b)	14	--	0.33	0.91	8.64	105306.99
%C.V	-	16.37	4.82	2.36	15.45	14.89

ns, * and ** : Non significant at the 5 and 1% levels probability respectively.

Table 3: Mean comparison the interaction of irrigation and variety effect on some traits of rapeseed

	Grain yield		1000 SW		Oil %		N.of grain in fructify		Oil yield	
Irrigation	Varity Opera	Varity Zarfam	Varity Opera	Varity Zarfam	Varity Opera	Varity Zarfam	Varity Opera	Varity Zarfam	Varity Opera	Varity Zarfam
regular irrigation	3996 abcd	5021a	3.82 ab	3.77 abc	39.49 cd	40.57 bcd	19.5 c	16.2 abc	1582 abcd	2040 ab
cutting irrigation in stage of tillering	2971 bcde	3758 abcd	3.77 abc	3.8 abc	39.63 bcd	40.5 bcd	20.6 a	13.3 c	1173 cde	1509 bcde
cutting irrigation in stage of flowering	2167 e	4108 abcd	3.61 bc	3.84 ab	40.5 bcd	41.49 ab	13.6 c	17.6 abc	879.5 e	1716 abcd
cutting irrigation in stage of fructify	2838 cde	4204 abcd	3.69 abc	3.78 abc	39.19 d	41.26 abc	15.3 abc	15.3 abc	1116 cde	1729 abc
Cut. Ir. in stage of tillering and flowering	4404abc	5133 a	3.45 c	4:00 AM	39.85 bcd	42.52 a	14 bc	18.3 abc	1760 abc	2175 a
Cut.Ir. in stage of tillering and fructify	3638abcde	2625 de	3.66 abc	3.83 ab	38.75 bcd	41.23 abc	15 abc	19.6 ab	1409 bcde	1080 de
Cut.Ir. in stage of flowering and fructify	4129 abcd	4496 ab	3.84 ab	3.92 ab	40.32 bcd	42.56 a	15 abc	16.3 abc	1666 abcd	1913 ab

Means in each column having similar leter (S) , are not significantly different at the 5% leve (DMR-Test)

Table 4: Simple correlation coefficients among different traits of rapeseed cultivars

	Grain yield	1000 SW	Oil %	No. of grain in fructify	Oil yield
Grain yield	1	0.137ns	0.202**	0.163ns	0.993**
1000 Seed weight		1	0.446**	0.104ns	0.169ns
Oil Percent			1	0.356*	0.308*
No. of grain in fructify				1	0.203ns
Oil yield					1

ns * and ** : Non significant at the 5% and 1% levels probability respectively

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