The effect of low irrigation in growth stages on yield and components yield oilseed rape cultivars in sistan

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Abstract

In order to determining the effect of low irrigation in growth stages on yield and components yield oilseed rape cultivars an split–plot experiment on based of randomized complete block design with three replication was conducted in zahak Agirculture Research station of zabol, during two seasons (2002- 2003 and 2003-2004).This site located in Southern East Iran country. Cultivars on two level (C1=(pf/7047) Sarigol and C2= Hyola308) established in main plot and low irrigation in six levels include (T1(control)=irrigation in roset, buding,flowering,pod formation and filling grain stages T2=irrigation in buding,flowering,poding and filling grain stages T3=irrigation in buding,flowerin and pod formation stages T4=irrigation in roset,flowering and filling grain stages T5=irrigation in buding and pod formation stages T6=irrigation in flowering and pod formation stages. Results achieved from combination analysis showed low irrigation had difference significant at the 1% level on number silique in plant, number seed in siliqua, 1000seed Weight, hieght, grain yield, oil percent and oil yield.

Comparison between means showed that T1 and T2 treatments had highest grain yield (3080 and 2970 kg/ha respectively) than T6 treatment with least grain yield(1855 kg/ha) have 23% and 25% more grain yield respectively. Effect cultivars on Silique number in plant, height, at the 5% level and on seed number in silique,grain yield,oil yield, was significant at the 1% level.Hyola 308 hybrid with 2945kg/ha showed 21%more yield than PF/7047 cultivar.The most and least oil percent were concerned to T1(control) and T5 (47% and 44%) respectively. Cultivars had not Significant difference. But From aspect oil yield Hyola 308 hybrid 39% had increased than PF/7047 cultivar. The interaction effects of treatments measured on yield and components yield were not significant.

Key words:Rapeseed,Drought,cultivar,growth stage, Grain yield

Introduction

Drought is an danger for successful production of crops in all of the world and when that was cerated that combination of physical and environment factors became cause inter stress in plants is reduced of yield.(Azizey et al..1999).

Water stress after flowering had adversely affects on drymatter and seed yield of mustard and canola. Contrary to expectation mustard did not show any yield advantage over canola under sever water stress but dry matter production of mustard was greater than canola(Gunasehera et al, 2003).

Water stress mainly effect is from reduction number of silique in plant being cause seed yield of reduced. Stress on grain protein percent had no effect significant. but is the caused significant increas glucosinolate contents in grain(Pasebaneslam et.al. 2001).Under water deficit of seed sizes as a reaction compensatery in forent reduction number of silique and seed in silique was increased(Jenson et al.1996).

Water deficit in the flowering stage until the end grain filling stage yield and yield components was affected mostly,the number of seed in silique was among yield components that were affected by water stress.(Shampoliver. etat,1996). Irrigation of interruption during vegetative (roset), stem elongation and siliqua formation stages had no difference significantly with control treatment. Whiel that irrigation interruption during flowering and grain-filling stages in comparison with control was showed reduction significantly. Between cultivars, Hyola 308 had the most grain yield.(Shiranyrad et. al,2000).

In the sistan region because of have dry and warm climate, water deficit is the most important factor for limitative growth and production crops.The perforformance such experiment in order to declear reactions of plant to water stress during growth different stages and find out stage from growth plant that to have low reaction to water deficit to be must greatly effective in canola cultivation in sistan region.

Materials and Methods

In order to determining the effect of low irrigation in growth stages on yield and components yield oilseed rape cultivars an split–plot experiment on based of randomized complete block design with three replication was conducted in zahak Agirculture Research station of zabol, during two seasons (2002- 2003 and 2003-2004).This site located in Southern East Iran country. Cultivars on two level (C1=(pf/7047) Sarigol and C2= Hyola308) established in main plot and low irrigation in six levels include (T1(control)=irrigation in roset, buding,flowering,pod formation and filling grain stages T2=irrigation in buding,flowering,poding and filling grain stages T3=irrigation in buding,flowerin and pod formation stages T4=irrigation in roset,flowering and filling grain stages T5=irrigation in buding and pod formation stages T6=irrigation in

flowering and pod formation stages. Each subplot include 6 planting row with 6 m longth and 20 cm space.On basise soil of test in pre planting used 150 kg/ha super phosphate triple, 170 kg/ha k_2so_4 and 380 kg/ha urea. One thired From urea in pre planting, one thired in out of roset stage and other used in initation flowering stage. Before from irrigation was performed sampling of soil for determine soil moisture and thereafter irrigation depth with use sail of physical factors and follow formulation was estimated. d=(FC-θ)*Pb*D/100

d = depth of irrigation water. F.c = soil moisture weight of percent in field capacity stage A = soil moisture weight percent before irrigation. *Pb*= external specific weight

D = root extension depth of majority.

Calculative of irrigation rate from way contor intery each polt. Ten samples plant from each plot evaluated for determine components of yield and other traits studied.Analysis of variance performed by Mstat-c software.and for compare mean used from Duncan test in 5% probability level.

Results

Seed yield:

results analysis of variance showed There are significant differenc cultivars and intrruption of irrigation on seed yield at 1% probability level (Tabel.1).In total two year in among cultivars Hyola 308 Hybrid with mean 2945 kg/ha in comparison with PF/7045 variety with mean 1963 kg/ ha had 21 percent more seed yield.Water deficit during roset, buding and grain-filling steges (T6: Treatment) with mean 1866 kg/ ha in comparison with T1 and T2 Treatments that have 3080 and 2970 kg/ ha respectively the largest seed yield(Tabel.2).This result with report of shiralnyrad, 2001 and champoliver, 2001 was confirmed.

Number of Silique in plant :

The effect variatey at 5% and irrigation intrruption at 1% probability level on number of Siliqu in plant showed significant difference(Tabel.1) Hyola 308Hybrid produced the maximum number of Siliqu in plant (191).Water Stress during vegetative (roset), Flowering and grian filling stages reduced number of Silique in plant (166) (5 treatment) and T1, T2. treatments producd the maximum number of Silique in plant 213 and 198, respectively (Tabel.2). This result with report of pasaban eslam (2001) is in accordance. Pasebaneslam(2001) reported that water stress during flowering stage and after it with creating limitative in photosynthsis Proportion number of actual silique than potential reduced.

Number of seed in silique.

The effect varieaty and water interruption on number seed in silique had significant difference(Tabel.1) Hyola 308 Hybrid with (33 seed) than to PF/7045 (17 Seed) had most seed in silique. Between irrigation treatments, T1 and T2 treatments with(22) seed in silique have largest and T5 treatment (interruption of water during rost, Flowering and grain filling steges) with (17) had minimum seed in silique (Tabel.2). Original factor in reduction number seed in silique the most abortion flowerts dut to stress happen in during flowering stage.Shampoliver (2001) reported that number of seed in Silique was the most combination from components yield that were affected by water stress.

1000 seed weight:

1000 seed weight is one of the important yield Components in canola. The maximum 1000 grain weight was productd by T1 treatment (irrigation in all of stages) and T2 treatment (interruption water in rost stage) with mean 3/02 gr while the lowest with mean 2.49 gr in T5 treatment (interruption water in roset, Flowering and grain filling steges) was achieved..(Tabel.2). Differences in 1000 seed weight cultivars might be due to the genetic of variation.

Oil content:

The effect year and water interruption at 1% level was significant difference Oil content(Tabel.1)but cultivars had no significant difference in total two year. The most oil percentage in control treatment and interruption water in during Vegetative (roset)stage with mean 47 Percentage was achieved..(Tabel.2). Water deficit in terminal growth stages Such as flowering and grain filling reduced oil content. The result is accordance with that of shampoliver (1996), who repoted that water stress the caused reduction oil contents in grain canola. Cultivars had no significant difference.

Oil yield:

The effect water interruption at 1% level was significant difference Oil yield. (Tabel.1).but cultivars had no significant difference in total two year.The maximum oil yield was achieved in Hyola 308 Hybrid with mean 893 kg/ha in T1 and T2 Treatments and the lowest oil yield with 564kg/ha to T5 treatment was belonged (Tabel.2)

Discussion

Whearas of formation of components of yield such as number flowerate, branchs and number silique in plant are in stem elongation growth and preliminary of flowering periods. Irrigation interruption in Budding stage is main factor for became less silique in plant and irrigation interruption in flowering stage is case of siliques abortion and that don't reach to maturity stage and this effects in T5, T6 is reduced of silique number and yield. In spite of reduced silique number and number seed per silique in T4, T5, T6 treatments, and increase grain weight as reaction of compensation but increasing yield in this stage didn't happen. PF/7045 cultivar because of late flowering and maturity, silique formation and seed formation with unsuitable condition as high temperature, drought, and warm wind encounter and finaly became short of this stages and as a result yield than Hyola 308 Hybrid is low.

Conclussion

whearas water deficit in first planting season we can dont irrigation in roset stage in soil with heavy textuer. But Irrigation in Budding and floweing and siliqua formation stages is necessary. and Hyola 308 Hybrid With high water use efficiency had the most yield and oil in T2, T1 and T3 Levels and early maturity is good for cultivation in this region with particular weather.

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Table 1. Variance analysis on grain yield and components yield of canola(Combined)

S.O.V	df	grain yield	Mean squares				
			siliquar number in plant	seed number in siliqua	W1000grain	Oil percent	Oil yield
Year	1	1197894.014na	316.681ns	2ns	0.245ns	2274.752**	2620523.556*
Error(a)	4	130504.889	430.972	7.069	0.035	0.955	3297.444
Water intrrupion	1	1734056.347**	7708.681*	410.889**	0.000	12.169	4300266.889**
Y ear* Water intrrupion	1	2399145.125ns	485.681ns	34.722*	0.067ns	22.759ns	1142568.056ns
Error(a)	4	2930054/444	385.139	2.431	0.099	4.738	170176.139
Cultivar	5	14620884.56**	6231.714**	25.256**	0.781**	11.920**	645127.100**
Year* Cultivar	5	1754908.903ns	444.314	7.4ns	0.208*	2.789ns	401060.022ns
Water intrrupion * Cultivar	5	458527.236ns	1482.114	4.822ns	0.116na	5.489*	23514.889ns
Year* Water intrrupion* Cultivar	5	1967029.458ns	2277.314	7.589ns	0.118ns	0.930ns	105631.389ns
		7841080.667	1118.756	4.333	0.075	1.631	50489.292
Error(b)	40	18.04	18.5	10.78	9.72	2.81	19.75

* and ** : Not Significant, Significan at the 5% and 1% levels respectively. ns,

Table 2. Comparison of means of grain yield and components yield of canola in different treatments

Treatment	grain yield(kg/ha)	siliquar number in plant	seed number in siliqua	W1000 grain (g)	Oil percent	Oil yield(kg/ha)
Water intrrupion						
T1	2970a	213a	22a	3.183a	47a	1391a
T2	3080a	198ab	21a	3.017ab	46a	1429a
T3	2532b	187abc	20ab	2.683cd	44b	1137b
T4	2178bc	171d	18bc	2.867bc	46a	1057b
T5	2110c	156	17c	2.492d	44b	958bc
T6	1855c	159cd	18bc	2.658cd	45b	853c
Cultivar						
Hyola308	1963b	170b	17b	2.817a	45a	893b
PF/7045	2945a	191a	22a	2.817a	46a	1382a

T1(control)=irrigation in roset, buding,flowering,pod formation and filling grain stages T2=irrigation in buding,flowering,poding and filling grain stages T3=irrigation in buding,flowerin and pod formation stages T4=irrigation in roset,flowering and filling grain stages T5=irrigation in buding and pod formation stages T6=irrigation in flowering and pod formation stages

means with similar lrtters are not significantly different at the 5%level of probability(DMRT 5%) In each column