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Investigation of Water Stress on Macro Elements in Rapeseed Genotypes Leaf (*Brassica napus*)

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Abstract: In order to study of changing of macro elements in water stress condition an experimental design was carried out to study effect of different levels irrigation (0, 25, 50, 75) percentage of Field Capacity (FC) on changing macro elements (N, P, K) in 5 rapeseed genotypes (PF7045-01, Symbol, Mohican, Hyola-42, Syn-1). The experimental design split plot in Randomized Complete Block with 4 replication at 2004. Investigation was carried out in Varamin university field research. The information gain about the yield grain, number of pods per plant, number of seeds per pods, weight 1000 grain, oil percentage and yield oil. At the end of investigation, for to valued quantity each element in each treatment, sample of leaf transmits in laboratory and valued quantity elements N, P, K. As result that in, quantity element in different levels irrigation and interaction between the both of them were significant. Interaction between genotypes and levels irrigation were significant at the 0.01%. Basically table of ANOVA in all of the treatment, drought stress were cause decrease quantity elements at different genotypes exception element N that with increase intensity drought stress, percentage that was increase in leaves. The yield impressed genotypes and drought stress levels. With increase intensity drought stress of 0.75-0%, mean Field Capacity decreased of 3340-1788 kg h^{-1}. Between genotypes, Hyola-42 and Symbol with mean 3377.5 and 1947 kg h^{-1} were highest and the lowest yield respectively. Oil seed percentage didn't impress on genotypes but with increase intensity drought stress, decreased quantity and mean were of 43.1%, at treatment irrigation 75% FC, to 40.2% in treatment irrigation 0% and 25% FC. With increase intensity drought stress, the quantity saturation fats and glucosinolates seed increased and quality oil decreased.

Key words: Rapeseed, water stress, genotype, macro elements, yield grain, yield oil and oil percentage

INTRODUCTION

At tendency increase world populations, asking increasing for agricultural produces, although wheat, Corn, Maize and Legumes main food humans but role of the seeds oil cant deny. Rapeseed with had contain 40 up to 45% oil percentage, is one of the valuable oil seeds. Oil rapeseed has 61% oleic acid and 8.8% linoleic acid that with comparison an other oil seeds, have better quality. Although rapeseed with climate condition drought and mid drought Iran but while growth climacteric, irrigation stress, have been conditioned that cause creation changing in growth and produce[1]. In action proved that if 25 mm water use in growth stage, is useful 100 mm water at the irrigation. Rapeseed is a kind of plant that nutrient more efficiently absorb of soil[2]. Also all of these conditions would be in full of irrigation. But at the drought stress, cause of closed stigmata and decreasing absorb Co_2, produce dry martial and use efficiency of element intensity decreased is the most important element in produce crop plant this element cause stimulus growth and is in structure amino acid, alkali and protein and porins. also cause to be produce enzymes and prevent the length of root. Use of the fertilizer contain N in *Brassica* caused increase growth and were yield seed use efficiency water up to duplication. Reported that cumulative N in rapeseed While drought stress and increasing whit highly intensity stress, cause of are decreasing use N in process growth. An other macro element in plant is P that compounds P are common are active energetic in plant (ATP). At the experience said that drought stress, quantity P more decreasing that this shortage can be see at the shoot member[3]. At this posture decreasing Conductivity hydraulics roots. Someone believe that P didn't efficient on oil and

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protean in grain rapeseed. but an other researchers, state inverse this posture and knowing shortage intensity P cause decreasing quantity oil grain of 33 to 23% and cause more decreasing PO_4^{-2}, HPO_4^{-}, $H_2PO_4^{-}$, glucosinolates percentage slightly increased and quality oil decreasing. At tendency to role catalyze K, because active 60 kind plants of enzymes and use efficiency better enzymes caused increasing photosynthetic and are producing dry matter and are increasing yield. Access rapeseed to K caused increasing hydrocarbons and proteins and results that cause increasing tolerance plant rapeseed related on dry stress. Effect on in dry condition, its very important because of K with rolled open and close stomata and finally change photosynthetic and formed organic acids Specially Malic acid that in process dry tolerance is efficient[6].

MATERIALS AND METHODS

This investigation was carried out for Study on effect of different levels irrigation (0, 25, 50, 75) percentage of Field Capacity (FC) on changing macro elements (N, P, K) in 5 rapeseed genotypes (PF7045-01, Symbol, Mohican, Hyola-42, Syn-1).The experimental design split plot in Randomized Complete Block with 4 replication at 2004. Investigation was carried out in Varamin university field research. Position experimental was at the longitude 51°39´ longitude long eastern and 35°19´ latitude width northerly and 1000 meter high sure of see. Each genotype planted at 6 barrows with length of 6 meter and wide 60 cm and surface each barrow inserted 3 lines with distance 20 cm each other planted. Planting was carried out at the 13th Octobers 2004. Time of start actions water stress in growth step 4.5 basis on inserted code period growth rapeseed that this step 50% was carried out all sprout on cluster flowered or are flowering at the 4 levels (0, 25, 50, 75% FC) At the first step, leaves, by the normal water and then with chloric acid 1% normal at the time lower than 30 sec and finally with normal water and deionizer water washed. Surface leaves drayed in free- air. For evaluate to dry matter samples 48 h inserted the oven set with 70°C. drayed samples then comminute with aid of oxidation humidity and by use of extract digestion for reading by set Atomic absorption provided that basis on data's gained of experimental plant, quantity of special element, by the tables limited critical evaluated. Oil percentage grain by method of Soxhlet in laboratory evaluated. At the final, yield oil each treatment, of multiply yield grain in oil percentage grain evaluated. Analysis variance data's experimental by software SAS and those comparison means by Duncan method were carried out at the 5 and 1%. For diagrams use of excel software.

RESULT AND DISCUSSION

The result that showed genotypes under the study, for percentage N leaves not significant also line Syn-1 with mean 3.3% and genotypes Symbol and Mohican with means 3.4% have lowest and highest quantity N (Table 1). But affection different levels irrigations on N percentage were significant and treatment irrigation basis on 0 and 25% FC by mean 3.7 and 3.5% N and treatment irrigation basis on 50 and 75% FC were means 2.8 and 2.5% N at dry matter highest and lowest class statistical . At the beyond of with tendency one of the role N in plant on under the water stress that have communion in produce matter osmotic such as praline protein in effect of decreasing metabolism. At this investigation at the water stress condition use N leaves decreasing and evaluated percentage N dry matter leaf rapeseed at the water stress condition, high the quantity. Additional hydrolyze protein at the highest stress level, in this investigation can be other reason for increasing N percentage in dry matter leaf, at rapeseed. Different genotypes for P in dry matter leaf didn't significant. Only two genotypes Symbol and Mohican against of N

Table 1: Means comparison of yield and yield components of five genotype rapeseed

Treatment genotype	N % in dry matter	P % in dry matter	K % in dry matter	Seed yield (kg ha^{-1})	Percent oil content (%)	No. of pods per plant	No. of seeds per plant	1000 Seeds (g)	Oil yield ($kgha^{-1}$)
(a_1)Hyola-42	3.3a	0.33a	2.59a	3377.5a	41.5a	175.4a	15.7a	3.9a	1401.7a
(a_2) syn-1	3.1a	0.35a	2.45a	3111.0a	41.5a	161.4a	16.2a	3.8b	1291.0ab
(a_3) PF7045-01	3.2a	0.31a	2.29a	2609.0b	41.6a	131.5b	17.8a	3.8b	1057.0c
(a_4) Mohican	3.4a	0.29a	1.5b	2062.3a	41.7a	99.2c	12.8b	2.7c	817.7d
(a_5) Symbol	3.4a	0.29a	1.21b	1947.0a	42.0a	14.9b1c	14.3b	2.9c	860.0d
FC%0	3.7a	0.18c	1.09c	1788.2a	40.2b	82.8d	13.9c	2.8d	753.0c
FC 25%	3.5a	0.25b	1.73b	2234.0b	40.2b	102.2c	14.8bc	3.3c	923.0b
FC 50%	2.8b	0.33a	2.51a	3122.8a	42.3a	151.8b	16.2b	3.9b	1355.0a
FC 75%	2.5b	0.35a	2.73a	3340.4a	43.1a	182.4a	18.7a	4.2a	1343.0a

percentage had lowest quantity P. But water stress was significant on P percentage in dry matter leaf. Two levels irrigation basis on 75 and 50% FC with mean 0.35 and 0.33% had first class statistic. Simultaneity with increasing water stress, P percentage leaf, started decreasing. Treatment irrigation basis on 0% FC with mean 18 percentages had lowest statistic. Quantity of P at this investigation at the different irrigation levels cached of 0.35-0.18%. Research showed that if there are in the around of root, quantity absorb P to be high[5] at the experimental ever, there aren't access this elements at this conditional water stress, when there wasn't water an other reason is for decreasing density element P in leaf.

Also someone of the researcher believes that at the dry condition, cumulative increase P in plant. But an other persons state that against. That quantity P in tissues plant at the humidity stress condition decreased that result in with result this investigation have compatibility. About 5 genotypes, have very different at K percentage. At the 3 first in mean comparison table have highest K percentage and 2 elements of means 2.59% in Hyola-42 cached to 1.21% in Mohican. Change in potash, in levels water stress was significant at 1%. Highest quantity for treatment irrigation basis on was 50 and 75% FC with means 2.37 and 2.51%. With intensity water stress, quantity K in the dry matter leaf decreased. Lowest quantity in the treatment irrigation 0% FC cached 1.09%. At tendency, to role of potash in tolerance dry genotypes have quantity this element in size limit in leaves rapeseed and cause has strength in plant. K by way adjustment balance water, different activities such as adjustment available open and close stomata, effect of photosynthetic and transmit matters photosynthetic- carbohydrates caused had more tolerance these genotypes to dry condition. This investigation at the in high intensity dry stress (0 and 25% FC) wilting leaves saw in through out day. K in preservation turgescent and open and close stomata are very important element. With increasing intensity water stress, quantity K leaves start to decreasing of 2.73 in 75% FC to 1.09 in 0% FC cached and signed wilting at the leaves. Decreasing quantity K in leaves plant under the drought stress reported by an other researchers. An investigation for comparable 2 genotype rapeseed and different level K definite the genotype that have more accessible to K showed more tolerance to dry condition Because of K in young tissues rapeseed for available turgescent are necessary. Yield and component yield were under the effect of genotypes and levels irrigation and interaction between them. The different of view point static were significant at the 1. Only the different oil percentage between genotypes not significant. Water stress was effect of significant on number of pods per plant and number of seed per pods. the pods per plant with the increasing intensity water stress of treatment irrigation basis on 75% FC percentage to treatment irrigation 0% of mean decreasing 182.4-82.8 number the result above had compatibility some of the research[7]. Number of seed per pods was under the genotype and dry levels and genotype PF7045-01 with mean 17.8 was the first class static and genotype Mohican with the 12.8 were the lowest class static. Levels basis on 75% irrigation FC with mean 18.7 was the first class and treatment 0% FC with 13.9 were at the lowest class static. also basis on some of the research humidity absorbed at growing period depended on kind and structure soil can be had positive effect on number of seed per pods and pods per plant[1]. At this investigations absorbed humidity in period growth were not more efficient. Weight 1000 grain, completely were under the effect of genotype and levels irrigations. Between different genotypes hylola-42 with mean 3.9 g and of water stress levels basis on 75% FC with mean 4.2 g had highest weight 1000 grain. the genotype symbol with the mean 2.7 g and irrigation basis on treatment 0% FC, with 2.8 g were the lowest class table of comparable means. Many of researchers were different significant state[3]. At tendency water stress with treatment irrigation basis on 0 and 25% FC that caused shortened period of growth vegetative, probably the tolerated genotype in this investigation by use of capability escaping of drought and high level P and especially K at this genotypes could be that result some of the researchers comparable[5] prevented of the decreasing intensity detail yield. Some of the researchers believe that quantity of yield in rapeseed first at all depended on to quantity N and level of water stress finally to genotype. In this study such as resulted evaluated by Straner and *et al*. [7], although N in the leaf showed increasing but at tendency to decreasing P and K effect of water in leaf *Brassica napus* and key role two elements, total yield grain intensity decreased. And hybrid Hyola-42 with mean 3377.5 kg h^{-1} first group and genotype symbol with mean kg h^{-1} were the lowest group static. The drought stress was cause decreasing grain yield. Grain yield was at the treatment irrigation basis on 75% FC of mean 3340 kg h^{-1} to mean 1788. 2 kg h^{-1} in 0% FC. The result some of the research showed that[2] drought stress was caused changes in quantity elements in the leaf and were caused decreasing grain yield and component yield[3,8]. Interactions at the highest levels drought stress hybrid Hyola-42 have highest grain yield. At tendency to would be high quantity K at this hybrid can be use for evaluated to genotype tolerance drought. Oil percentages between genotype not significant. Only effects of irrigation levels on basis FC were significant on 1%. Basis on table of compatible means had two

levels basis on 75 and 50% FC with the 43.1 and 42.3% highest oil percentage and had two treatment 25 and 0% FC with mean 40.2% lowest oil percentage. The similar result of the high oil percentage genotypes rapeseed under the irrigation related on condition stress stated by. Also decreasing absorb K and P in dry matter leaf, not efficient on quantity of oil and protein grain. But increasing N under the effect of drought stress, slightly decreased quantity oil grain. The yield of oil grain in block not significant. as while as effect of genotype and irrigation levels and interaction between them were significant at 1%, hybrid Hyola-42 mean 1401.7 kg h^{-1} and genotypes Symbol and Mohican with mean 860 and 817. 7 kg h^{-1} were highest and the lowest class static. The quality of oil was effect of different levels irrigation. With the increasing dry intensity the quantity of fatty acid saturation and glucosinolates seed increased. These researchers believe that drought stress was caused increasing fatty acid saturation with the long chain. In this investigation with the increasing dry intensity cause decreasing water of soil majority elements stabilized in the soil or didn't absorbable for plant. Also with the decreasing absorb water cause reduction humidity in soil, the elements that enter with water in plant, will be incapable enter in plant, at finally decreased quantity them in tissues especially in leaf cause process remobilization to grain in last period growth.

CONCLUSION

Differences are existing between rapeseed cultivars and lines in response to water stress that shown Macro elements can be change with stress. Also oil content decrease under this condition and this may be due to different accumulation of compatible solutes, and physiological aspects example yield and yield components.

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