Study the interaction of cultivation date and variety on the process of changes dry weight of the leaves, stems, clusters and flower, rice varieties on the date of winter and summer cultivation in Khuzestan

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Abstract: This research conducted for determination the rate and process of dried matter variation of plant organ rice varieties in summer and winter planting of Khuzestan as split-plot design in randomized complete blocks with two factors (planting date and variety) and three replication for one year (2009) in Shavoor Agriculture Research Station related to Natural Resources and Agriculture Research Center of Khuzestan with eastern length 48:28 m and northen width 31:50 m. The main factor in three levels, included date of cultivation 2009/3/17 (D1), 2010/4/14 (D2) and 2010/5/26 (D3) and rice varieties namely Hoveizeh (V_1), Hamar (V_2), Ramhormoz pollen (V_3), Dollar (V_4), N_{22} (V_5), Zanjan pollen (V_6), Eiry 3 (V_7) Eiry 12 (V_8), line7 (V9), Line 13 (V10) were examined as subplot. In this experiment, native and Khouzestan heat tolerance variety like Hamr with high growth duration and more tillering rate had the highest process of leaf dried matter, stem, total, and there is positive correlation among them (at level 1%). Tolerance and native varieties had the most suitable variations process of these indexes in every three dates of planting. In first and second date of planting, not produced remarkable fertile panicles because of exposing panicle with severe hot weather in July, Therefore they produced dried matter lower than third date of planting.
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Key words: Interaction, Date of planting, variety, changing process, Dried matter.

1- Introduction:

Rice is the main food for more than 2.5 billion people in the world and provides energy, 21% and protein 15% of the world (6). After wheat, rice is the second strategic product which is located in people's food basket in the world and because of its role in food security is located in self-sufficiency policy in the country. The areas under rice cultivation in the world in 2007, are more than 156 million hectares with annual production of 2/650 million tons of rough rice that over 135 million hectares of these lands are located in Asia (7).

Iran produced 2612174 tons and 630,562 hectares surface under cultivation, is the most important countries producer of this crop in the world (5). Khuzestan with production 219,809 tons of rice and 58,015 hectares the area under cultivation has fourth place in terms of area under cultivation and has fifth place in terms of production in the country (2).

There is two ways to increase rice production in the province: (1) increasing the area under cultivation of land that are suitable for rice cultivation.

2. Increasing the productivity of existing facilities and the crop harvest from the land area.

According to limitation of agricultural land, the second method has more important that with winter cultivation of rice in lands which do not have the ability of production of other agricultural crops and efficient use of water resources and current energy in the province and harvest more than one rice crop per year and reduction the costs of production can be achieved (1).

By studying the climate information of Khuzestan and needs of heat and light, these results obtained that two rice crops cultivation is possible in the province of Khuzestan per year. So that the first crop, in late winter and the second crop in late spring and early summer or planting from the former Raton crop (planting in late winter) is achieved. Winter rice cultivation in comparison with the summer rice cultivation has some advantages. In the summer rice cultivation, due to the high temperature of the air, abundant water rate is required to reduce canopy microclimate temperature.

Evaporation and water consumption is increased due to high air temperatures; on the other hand, high evaporation causes increase in the accumulation of salts in soils with poor drainage and it causes the soil salinity.

In winter cultivation rice, water use and soil salinity is reduced due to low air temperature evaporation. The winter rice cultivation does not interfere with other crops. Wetlands do not have ability of cultivation any crops, except the rice cultivation in Khuzestan province, which removes this concern; therefore, winter cultivation of rice in the current period of province does not cover the status of valuable plants such as wheat. Access to best

management practices of the rice winter cultivation through researches of crop breeding is possible, it is important to select the right variety and date of planting.

Select the appropriate date of planting, which is one of the most important factors in agricultural effective management which with the compliance of physiological and morphological processes of plant such as germination, maturity, vegetative growth, flowering, care and optimum weather conditions played an important role in the control production.

In this research, physiologic indexes are very important as one of the growth parameter in rice and their role in photosynthesis process and the final crop. Therefore, this research has conducted in order to determined the date of planting and suitable varieties for winter cultivation and during the research, 10 genotypes were evaluated on three date of planting until with identifying suitable varieties for winter favorite planting of rice can harvest more than one crop in agriculture land in one year with better productivity from the facilities and current conditions. The experiment aimed to achieved the relationship, the role of physiological parameters, the process of growth, their formation, their effect on rice grain performance in winter and summer date of planting was designed. Nagamatsov (1992) studied the operation of germination at low temperatures for many Kolivators of rice. Kolivators of temperate regions, such as Japanese species were able to germinate at low temperatures; however, tropical and subtropical Kolivators germinated slowly at low temperatures. Sato (1960) provided clear evidence of the high sterility causes by increasing temperature (8). Yoshida (1981) believed that sterility occurs in rice when the plant to be at 35 ° C (9) for more than an hour on the stage of flowering.

2- Materials and methods

The study were running at the Shavoor Agricultural Research Station, related to Agricultural Researches Center in Khuzestan province, located in 70 km north of Ahvaz between Karkheh and Karun rivers in 2009. Latitude 31 degrees and 50 minutes north and longitude 48 degrees and 28 minutes east, and its height from sea level is 33 meters.

The study was conducted in the method of split-plots designing in a Randomized Complete Block design (RCBD), three replications, two factors such as planting dates and varieties. The main factor i.e planting date was studied on three levels: 15 March 2009 (D1), 14 April 2010 (2) and 26 may 2010 (D, (3 and subplots including: Hoveyze varieties (V1), Hamr (V2), Ramhormuz pollen (V3), US $ (V4), N22(V5), Zanjan pollen (6V), foreign Dolain sent from the Erie (V7 and V8) and internal Dolain (V 10 and V9).

In this experiment, 10 varieties and the following promising line are considered as subplot. Hoveyzeh rice type is Khuzestan local varieties and mainly is grown in the Azadegan and Hoveyzeh city. Hamr rice type has the following features:

Completely tolerant against heat and salinity, very early, short-to-medium and high height, high tillering, a little clusters, high & rough light-green leaves with narrow stem which is sensitive against lodging and is cultivated in the Shadegan area more than other parts of the province (3.4). Ramhormuz rice type has the following feature:

Tolerant against heat, mass bush with many leaves and tree branch, good green cover, foot long, mass & spray bushes and curved & claw crow cluster, quite right flags and paddy grains rice with red colored.

Rice pollen type, have relatively high performance but it has the moderate commercial value, cooking qualities, and taste. Rice pollen types have a high resistance to pests, diseases and tolerant to water scarcity and drought stress tolerance (1). The Dollar type, the origin of this type is from India and adapted to the cold, long grain form, thin and it's color is reddish white and raw grain length is 7 to 7.5 mm (mean 25.7 mm).

During the studies that have done, this type especially in the summer, is well-suited to the conditions of province as well as it has well Raton cropping and somewhat sensitive to lodging and in comparison with other types in province, it is premature.

The N22 is international varieties which is heat tolerant. Short height and a high tillering varieties. It has small round seed and is somewhat similar to the seeds of Hoveyzeh. This type is consistent with condition of the province, especially in the summer cultivation and partly has the property Raton cropping and is premature varieties.

Zanjan pollen variety, is local varieties of Zanjan area and very resistant to cold weather conditions, in terms of appearance, it completely looks like Ramhormuz pollen with the difference that the weight of one thousand grains is higher and the number of grain in cluster is less than Ramhormuz pollen. This type is premature and is relatively short leg, it relatively has good compatibility especially in cold weather conditions in March and in the case of proper management, it is harvested before the start of hot air.

7V (C 547-1-2-3) and 8V (IR 1561-228-3-3) foreign varieties are being introduced. Their origin in North America and they are varieties which is tolerant to heat. They are small leg and full tillers and with long and narrow grains. Lines 7 and 13 (V9 and V10), are the choice of separated generations resulted from crossing varieties Hoveyzeh, Champa and red Anbory

in Khuzestan province with three varieties of rice in Mazandaran including the Nemat and Fajr varieties which are the hybrid seeds and tolerant to heat.

The number of experimental plots in this study equal to 90 plots (30 plots in repetition), and each experimental plot is considered with an area of 7.5 square meters (m 3 × m 2.5). The deletion of 50 centimeters from both sides of plot has done as the border.

In the first iteration, the primary and secondary levels were classically located but on the second iteration, the levels of numbers and main factors were considered randomly. Sampling was done every 20 days after performing the map of test plan.

Land preparation operations after reaching the soil moisture to limitation agriculture capacity field (FC) were done through the exercise of plowing by ploughshare, twice disk perpendicular to each other and leveling coatings (leveling), then plan after terracing and the establishment irrigation canals and drainage was done by boundaries and digger.

After the operation of land preparation and creation the condition of failed mud plots to height of 3-4 cm were irrigated, then seeds were germinated in the three days before each date of planting were soaked in water, base on 80 kilograms of seed per hectare is calculated and the plots were sowing.

To increase the temperature of the water in the plot and stimulate growth, water level height is increased to a height of 8-10 cm, this situation has continued until stem emerge completely from seed (5-4 days). Then the water level is fallen to the previous state (3-4) cm by starting with rice seedling stage, without draining the water from the plot, the amount of water in plot (height of irrigation water) was kept at the same level.

Starting with rice seedling stage, without draining of the water from the plot, the amount of water in plot (height irrigation water) was kept at the same level. This is due to keeping warm plant growth environment in the early vegetative growth and contribute to the establishment of seedlings but with the starting of warm weather to reduce the adverse effects of high temperature water plant, irrigation process has done like the daily arriving and departing with maintaining a height of 4.3 cm.

During the growing process for providing adequate ventilation in the soil and reduction of the potential toxicity such as the micro elements, water plots have been cut off for 5-4 days (especially at the end of tillering stage and the beginning of stem elongation).

Entering the water into the plot were stopped 10 days before harvest. potash from the source of potassium sulfate at the rate of 100 kg per hectare, phosphorous from the source of ammonium phosphate at the rate of 50 kg per hectar, zinc from the source of sulphate at a rate of 40 kg per hectar were consumed for soil application and planting time.

The nitrogen element from urea compost source at the rate of 250 kg urea per hectare at four parts of 25%, including the finishing stage of seedling, the beginning of stem elongation (end of tillering), stage of pregnancy and time of 50% emergence of cluster without constant layers of water at the foot of plants were used at 9 varieties, but the Zanjan pollen rice 150 kg per hectare is used with the same parts. Weed control was done by integrated method includes hand weeding and using herbicide D 2-4 at the rate of 1/5 liter per hectare.

In this physiological study, leaf dry weight (LDW), stem dry weight (SDW), total dry weight (TDW) and cluster dry weight were measured in 20 days periods and was calculated base on the calculation formulas, the above measurement and calculation parameters are listed as follow:

All the leaves are sampled from every plot (a box of 25 to 25 cm) which was removed from the junction of the sheath and 25 leaves per sample, in order to examine the growth process and accumulation of total dried matter from each plot of sample (with an area of 25 by 25 cm), the distance 20 days, cut off from the surface of the land and all its parts including leaves, stems and clusters are separated at 72 ° C for 48 hours inside the oven-dried and then weighed by the scale with accuracy of 0.02. In the experiment, samples were taken between 8-7 times from all experimental plots depending on the varieties or line and date of planting.

The total weight of the dried matter for above organs is considered as dried matter of all plants. Calculation and measurement leaf of dried matter: the separated leaves from the stems of each experimental sample which was weighed earlier in a paper bag, they inserted in oven for 48 hours at 72 ° C. After a given time, the samples were removed and weighed. After a given time the samples were removed and weighed. Dried weight of stem & cluster was measured and the total weight of leaf, stem and cluster were considered total dry weight. Statistical calculations, determination correlation coefficient by using SPSS software and drawing figure was drawn by EXCEL.

3- Results and Discussion:

Interaction between date of planting and varieties on the changing process of leaf dried weight:

At first, leaves have more Asmylat storage capacity because they were young and other plant tissues such as stems are still not created, therefore, leaf dried weight is increasing at first, but at the end of the growing season, leaves and other organs such as stems, seeds is dropped and the rate of leaf dried

weight is reduced due to the aging. Variety reaction is varied depending on the date of cultivation. In the first date of planting (116 days after cultivation), second (92 days after planting) and third (100 after cultivation), native & late mature like Hamr (V2), the highest level of curve, and the Zanjan pollen (early mature), the lowest level of curve, have had leaf dried weight.

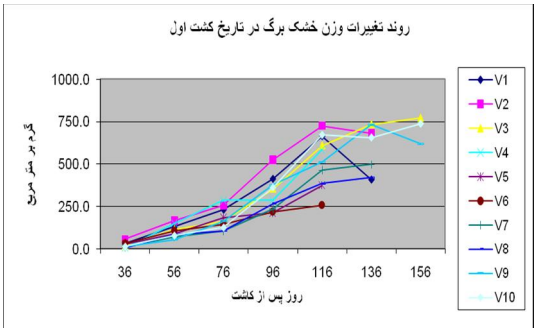

Figure 1-1:

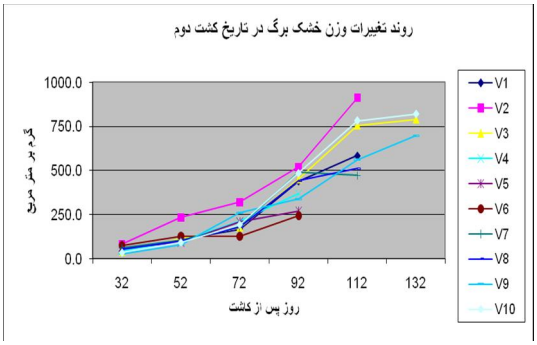

Figure 1-2:

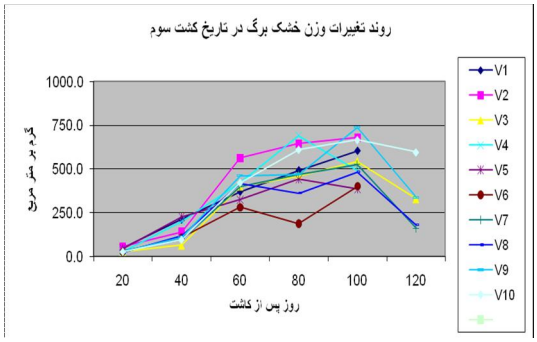

Figure 1-3:

In the first date of planting (36 to 56 days after planting) because of the cold in the beginning of growth season and weak settlement of the bushes, the surface of the curved are lower, but in the second date of planting (32 to 52 days after planting) because of high temperature and germination rate of the curve is higher. In the third date of planting, due to production of fertile cluster (100 days after cultivation), the curves with moderate slope is decreased while in the first and second date of planting due to insemination treatment and pollination with high heat in June and non-productive fertile cluster, long vegetative growth of the curves is also increasing. Therefore, native variety and tolerant to Khuzestan weather condition like Hamr have the best changing process. Figure (1-1), Figure (1-2), Figure (1-3).

Interaction between date of planting and variety on changing process of stem dry weight:

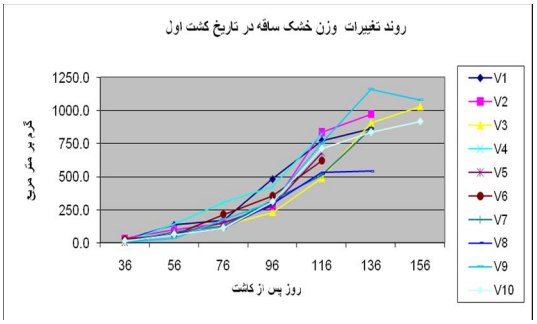

Figure 2-1:

Figure 2-2:

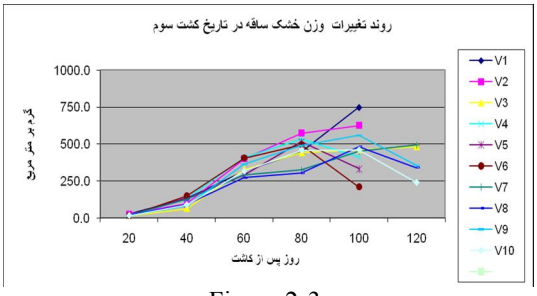

Figure 2-3:

At first, with transfer of photosynthesis materials from leaves to stems, stem dried weight is increasing and at the end, retransfer the matters stored from stems to seeds, stem dried weight and panicle is reduced. Variety reactions varied depending on date of cultivation. On the first date of planting due to lower temperatures, better lighting conditions, tillering and stem period, less breathing of plant society and save

more matters in the vegetative plant, stem dried weight was more than the second and third date of planting and the curves were at a higher level.

Despite warmer air, the second and third date of planting that can stimulate tillering but due to thermal stress and the reduction of non-structural carbohydrates, tillers and stem growth have fallen. From 36 days to 116 days after planting, in the first date of planting, Dollar type was the topest on the curve and local varieties (Hamr, Hoveyzeh, Rahormoz pollen and V9) also after it were ascending. On the second date of planting, native variety, Hamr, from 72 days to 112 days after planting were on the top of curve and after passing 112 days (Hoveyzeh native variety V9 and V10) were ascending.

On the second date of planting, the conditions were more favorable for plant establishment and production of tiller and stem due to loss of stem, some part of photosynthesis were stored in the stems. On the third date of planting, from 60 to 100 days after planting native varieties like Hamr and then Hoveyzeh were on the top of their curves due to the production of fertile clusters, stem weight varieties were reduced. Therefore, native variety Hamr and Hoveyzeh have the most appropriate process changes for stem weight. (figure 2-1), (figure 2-2), (figure 2-3).

Interaction date of planting and variety on changing process of total dried weight.

Variety reaction varied depending on date of planting. On the first date of planting, Dollars revised variety were on the top of curves from 56 days to 116 days, after planting due to much opportunity for growth stems and high tillering, after that native variety was the ascending and the lowest total dried weight Zanjan pollen was at the bottom of the curves. On the second date of planting, 32 to 112 days after planting, the native and adaptable variety Hamr, then the winter lines V10 were on the top of curve and V9 were on the bottom of curve.

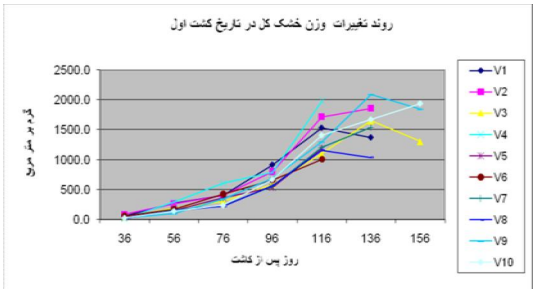

Figure 3-1:

On the third date of planting (100 days after planting) native & tolerant variety like Hamr were on the top of curve. From 60 to 90 days after planting, the V8 variety was faced with a sudden rising and falling. At this date, also the Zanjan pollen rice was at the bottom of curve. Therefore, adaptable, tolerant and native varieties like Hamr due to the high rate of tillering, the long period of growth, raised & compound leaves, allow the light penetration to the lower leaves and more dried matter was produced in the first, second and third date of planting. (Figure 3-1), (Figure 3-2), (Figure 3-3).

Interaction date of planting and variety on changing process of dried weight cluster.

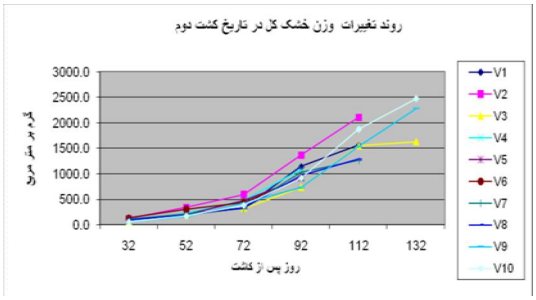

Figure 3-2:

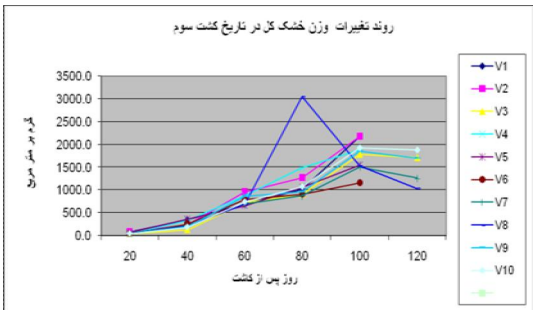

Figure 3-3:

Figure 4-1:

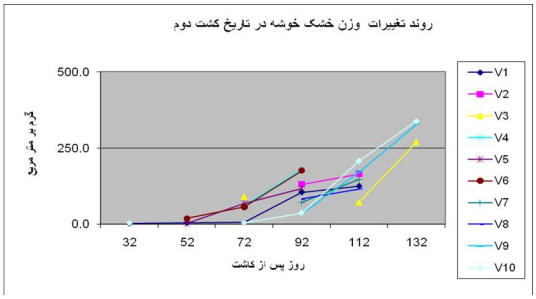

Figure 4-2:

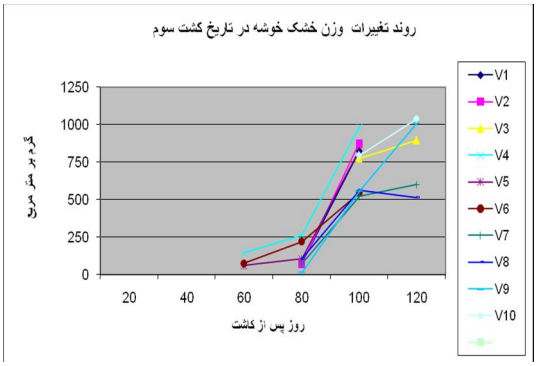

Figure 4-3:

In the firs date of planting, the increase weight of cluster was minimum from 96 to 136 days after planting varieties such as V9, Dollar and then Hamr and V10 were at the top of curve. On a second date of planting, from 52 to 92 days after planting zanjan pollen was at the top of curve and from 92 to 100 days after planting, Hamr was at the top of curve and cluster weight increase was negligible. From 112 to 132 days after planting, V10 was ascending and the increased weight of cluster due to cross pollination with high heat of July was negligible. On the third date of planting due to conflict inoculation with cool in mid-September, the process of increase weight of cluster was high and significant. From 60 to 100 days after planting, firstly Dollar Variety (V4) was at the top of the maximum and do not have major differences with varieties such as Hamr and Hoveyzeh, from 100 to 120 after cultivation, varieties such as V10, V9 and Ramhormuz pollen were at the highest level of dried weight curves. So native varieties like Hamr, Hoveyzeh, Ramhormuz pollen, winter varieties (V9 and V10) and revised Dollar in third date of planting, have high weight (Figure 4-1), (Figure 4-2), (Figure 4-3).

Table 1 Correlation coefficients of physiology features of rice

	LW[1]	SW[2]	TW[3]
1	LW		
1	**310/0		SW
1	**387/0	**680/0	TW

* And ** respectively, is significant at the 1 and 5%,

Conclusion

1. The native & tolerant varieties specially Hamr and Hoveyzeh have the most appropriate changing process of leaf dried weight, stem dried weight and total dried weight at each three date of planting.

2. There is a positive correlation between leaf dried weight, stem dried weight, total dried weight (at 1%).

3. In the third date of planting, due to production of fertile cluster and active tanks total dried weight varieties was far more than on the first and second date of planting.

4. In the third date of planting, varieties such as Dollar, Hamr, Hoveyzeh, V10, V9, Ramhormoz pollen, do not produce many fertile cluster.

5. The highest and lowest leaf dried weight in three date of planting, respectively, related to Hamr and Zanjan pollen variety.

6. Sterility florets and clusters on the first and second date of planting due to conflict of pollination with extreme heat in July that casues increased stem dried matter by the end of the growing season.

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