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Effect of plant density on yield and yield components of sunflower varieties in temperate regions of Kermanshah

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ABSTRACT

For studying the stand effect on morphological and physiological properties of sample sunflower varieties, factorial testing project was applied as complete random blocks. It was replicated four times. There were 3 levels for sunflower varieties: Alastar(V1), Master(V2), Progress (V3). They were obtained from research Institution of seed improvement and seedle preparation of Karaj oil seeds research section. Density in 3 levels include: 66600, 83333, 111000 bush per hectare (density level were: D1:6.6 bushes per sq.m., D2: 8.3 per sq.m., D3: 11 .1 per sq.m.). The project was implemented on investigative field of the Islamic Azad University of Kermanshah, located at 20 km. to Kermanshah province, at Bisetoon city. The results implied that the effects of varieties were density on stem diameter, leaf area index, bush height, weight of 1000 seeds, head diameter, seed yield, oil yield biomass and significant harvest index. Also the effect of variety x density on head diameter was recognized meaningful biomass.

Key words: sunflower varieties, 2nd, cultivation, crop intensity, yield, yield components

INTRODUCTION

The oil seeds are the second food stocks after the cereals in the world. Because they not only have enriched of fatty acids but also they are full of proteins. Of these oil seeds, the sunflower is the fourth annual crops after soya, colza and peanut being cultivated as food oil in this regard. This process of course introduces short foot hybrid cultivar and variety that its oil and seed degree is not only high but also it provides fruitful and useful possibility of harvest in this case. [1]. One of the most paid attention issues is subjected to the determination of sunflower suitable harvest accumulation to meet optimized extremely production performance. A range of accumulation can be considered for the sunflower. The development of research activities to determine different cultivation issues, suitable accumulation, positioning various cultivars and oil productions have important role in this regard. The sunflower is one the plants that has been established in the country's oil seed programs. The sunflower having features such as suitable climate adaptation, soil, high quality of the oil, short growth duration, suitable oil cake, is considered as the most favorable oil productions. According to the lowest information in the field of sunflower's varieties and cultivars reaction to different accumulations in the climatically conditions of Kermanshah City particularly in the second cultivation, the achievement and completion of this kind of research and study seem to be necessary. The main purpose of the study is to determine the most suitable harvest accumulation and cultivar for the second cultivation process of the sunflower [1].

MATERIALS AND METHODS

In this research, the factorial experimental plan was used as complete random blocks in four iterations that each patch includes 8 stacks and the length of each stack is considered 6m and the distance of the harvest lines is 60cm in this study. In beginning, the features of the determined soil and suggested compost degree were applied based on soil test by the degree of 150kg Ammonium Phosphate and 100kg Urea in Hectare. The necessary patches were dug by an excavator before the third harvest of suggested urea and the remained degree of the compost were also applied in the steps of 6-8 leaves of the plants. Seedling was achieved by hand as a three hills line in this case; after the germination and the establishment of the shrub and when the height of the shrub reached to 10-15cm, the process of pruning was fulfilled by a pruning-shears. The operation of pruning was done by handy prune. The depth of seedling harvest was considered 4-5cm. the first irrigation process was simultaneously achieved by the harvest and the next irrigation was applied after few days for the facilitation of herb's growth. The irrigation cycle has been based on the plant appearance features, regional and climate conditions during 7-10 days. In order to register the germination period, two lines were devoted and established in each patch specifying the middle of each four meter of the patches; in the other hand, to make sampling of the growth process, two marginal lines were eliminated and the sampling was achieved from the two internal lines (lines 2 and 7); of course, two next lines were also omitted and two middle lines were considered for the final cultivation. Three plants were crossed from the stem for sampling process and transmitted to the experiment; after the determination of plant features such as plant height, number of leaves, stem diameter and storey diameter, the different parts of the plant were separated and kept in an autoclave at 74 centigrade for 48 hours and then their dry net weight was measured and registered. The distance of sampling was considered as the second harvest along with the shortest growth duration as 10 days in this case. In every sampling, three bushes were selected and in the next sampling, two plants were cultivated as margins as well as three other plants; this never let have any impacts on the other bushes space.

In the whole samplings, half meter from the beginning and half another meter of each end of the lines were eliminated and the left bushes were cultivated. The final harvest will be achieved from each patch with omitting half meter from the margins. The index of the harvest was also measured by the harvest of 10 complete bushes from each patch. In order to measure and calculated the number of each seed in the basket, 10 baskets were obtained in the final harvest accidentally and the number of the seeds is counted into the basket. To measure the weight of thousands seeds from each minor patch, for 250 pairs samples were selected and calculated after weighing the mean four samples as the mean weight of thousands seeds from each attendance. In order to measure the proportion of the kernel than seed's membrane, a 15g sample was extracted and then peeling their kernel and membrane to weigh and measure their proportions than each other. In order to measure the performance of the seed, these seeds will remain in the air for one week after separating their seeds and when their humidity reached to 13%, they would be weighted and determined the seed performance. The percent of the seeds oil was carried out by NMR machine. The percent of seed's protein was also fulfilled by Kjeldal method and the combination of fatty acids was achieved by chromatography gas method in the laboratory of oil seeds research center of Karaj City.

RESULTS AND DISCUSSION

There was observed a significant difference between the variance analysis of cultivar effect and the accumulation on the herb height and stem diameter; the height of the shrub with the accumulation increase of 6.6 to 11.1 in m² shows that any increase in the accumulation of the shrub leads to the linear increase in the height of the sunflower shrub; but, the highest diameter of the shrub is subjected to the accumulation of 6.6 m² shrub with 15.40mm stem diameter. The comparison of the mean height related to the shrub show that the highest height of the shrub is 187.7cm that is called hybrid progression in this regard. The all-star hybrid having 16.49mm stem diameter is the highest stem diameter. The decrease of the plant height and increase of stem diameter may be useful in raising the tolerance of the sunflower than any torpid. The increase of the plant height by decreasing the distances between the shrubs on the lines can represent that due to the high number of the shrubs based on the surface increase, the plants get intensified to compete for absorbing the sun rays together. (7). The comparison of the mean accumulation care on the index of leaf surface indicated that the progress hybrid having 4.722 leaf surface has the highest degree and any increase in this accumulation leads to the increase of leaf surface in this case. So, an accumulation of 11.1 in the shrub (m²) makes 5.679 leaf surfaces as the highest index of the leaf surface. In the accumulations of 8.3 and 6.6, there were significant differences together. Any increase in distances of the plants leads to the increase in leaf surface. Also, the accumulation of the shrub is effective in the number of the leaf. In low accumulations, there is observed decrease due to the competence between the plants in relation to the degree of photosynthesis materials being constructed by

the leaf surface in the plant [2]. the variance analysis related to the cultivar effect and accumulation and bilateral effect of the basket diameter as well as the number of the seed in the basket has significant difference in this regard. The comparison of the means showed that the cultivar of the all-star hybrid has the highest basket diameter and number of seeds in the basket. With increasing of the accumulation, the basket diameter and number of the seeds would get decreased and the highest of these were related to the all-star cultivar in accumulation 6.6 shrub in m². Therefore, it can be stated that due to the decrease of shrub height in the lowest accumulations and also increase in the stem diameter, it can be concluded that how the height of the plant is shorter, it makes the transformation of the food materials easy into the plant limbs. Hence, it causes to the increase of the stem diameter, basket diameter and the number of the seeds into the same basket [1]. the variance analysis related to the cultivar effect and accumulation on thousands seeds weight has significant difference together. The comparison of the main mean effects of the cares showed that the all-star hybrid is prior than other two cultivars and the accumulation 6.6 shrub in m² has the greatest weight of the seeds produced having difference together. The changing way of thousands seeds weight by changing the distance between the shrubs is that hoe this distance is getting higher between the shrubs, the thousands seeds weight will get decreased [10]. The variance analysis related to the cultivar effect, accumulation, and bilateral effect on biomass has significant difference. Also, due to the table of mean comparison in main cares effect, accumulation 11.1 shrub in m² produced 1372g dry material in m² and the greatest biomass is subjected to the progression cultivar. With increasing the accumulation, the biomass will get increased, too. Due to the competence between the shrubs in accumulation 11.1 of shrub in m² has been increased. This makes that little stem and leaf is germinated on the shrub and finally the number of stem or the main shrub gets increased. Due to the fact that the weight of stem is higher than leaf and plant, thus it raises the biomass [9, 10]. The variance analysis related to the cultivar effect, accumulation on the seed performance has significant difference. The comparison of the means showed that the all-star hybrid with 432g seed in m² is prior than two other cultivars and accumulations 11.1 and 8.3 in m² are 405.6g and 382.2g in m² as the highest seed performance. in accumulation 6.6 shrub in m² due to the lowest number of the shrub in surface level, the seed performance gets decreased; with increasing the accumulation and reaching to a suitable accumulation (11.1 m²), the seed performance gets increased; according to the obtained results, with increasing the accumulation due to the competence among the shrubs and the decrease of the seed weight and basket diameter, the seed performance stays fixed in surface level. How the shrub accumulation gets increased, it causes to the increase of biomass; due to that the high food material get saved in the stem and leaf, the germination growth causes the plant to transform high food material into the stem and leaf in this regard and as a result, the thousands seeds weight and biomass get increased leading to high potential performance in this regard [5, 6]. There is a significant difference in the variance analysis of the mean related to the cultivar effect and accumulation on the harvest index. The comparison of the means related to the harvest index indicated that the highest harvest index by 42.68% is subjected to the all-star hybrid. The obtained results represent that the efficacy of all-star hybrid is prior than two other cultivars in transforming Acimilates to the seeds. The progress cultivar as the highest degree of the biomass showed the lowest index in transforming the materials through the photosynthesis to the seeds and the highest degree of the harvest is subjected to the accumulation effect of 8.3 shrubs in m². The harvest index showed the accumulation increase 6.6 and 8.3 in m² and then showed decrease in higher accumulations. The reason of decrease in harvest index in higher accumulations 8.3 can be related to the increased competence among the shrubs and for the reason, the produced seeds would be slack and thinned and the seed performance decreased than biomass [11]. The variance analysis related to the cultivar effect has significant difference; the comparison of the mean cultivars showed that the all-star hybrid with 163.2g productions is prior than other two cultivars. The comparison of the main mean effects about the cares showed that the accumulations 11.1 and 8.3 in m² were 161.8 and 19.7g oil in m² as the greatest performance that no any significant difference found in this regard. The process of the changes in oil performance is like the changes of the seed performance process. Apparently, although the genetically diversity in oil percent is important, the environmental effects are also essential in the process of the growth. The most important environmental factors in decreasing the percent of sunflower oil seed are the humidity tension, diseases, high levels of nitrogen, soil salinity, late harvest after ripeness and high and low temperature. Along with the field conditions, the temperature effect is not fixed on the oil percent. Some studies represent the increase of the seed oil percent with increasing the mean temperature to 27 centigrade [12]. For the second cultivation of the sunflower in temperate regions of Kermanshah Province, the all-star cultivar is suggested that due to the high performance and accumulation 11.1 of the shrub in m² causes to the high potential performance in this regard. That is, it will be early than two other cultivars and never reaches to the precipitation season but it will evolves the high steady feature; however, it will be more suitable for mechanical harvest due to the shortest height in this case. Also, it will have basket diameter and higher oil percent and more harvest index than two other cultivars.

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