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A STUDY OF THE EFFECTS OF SOWING DATE ON YIELD AND YIELD COMPONENTS OF SUNFLOWER (HELIANTHUS ANNUUS L.)

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***Abstract*—** High yields of grain and sunflower oil need to match of vegetative and reproductive growth stages of the plant with favorable weather conditions by selecting appropriate sowing date. A split plot experiment, according a randomized complete block design (RCBD) with three replications was performed in the research field of Scientific and Practical Center under agricultural dept. of *Monad University*, Hapur in 2012. Main plot were sowing date (20 May, 5 and 20 June) and sub-plots were six sunflower cultivars (Pomar, Euroflor, Master, Sirna, Azargol and Armaviruski). Results showed that between cultivars was significant for grain yield, biological yield, head diameter, stem diameter, stem height, grain empty percent, head dry weight, dry weight of stems and leaves. Grain yield of Euroflor (556.3 g m-2) was the most of the other varieties. The superiority of this variety was due to increased diameter and dry weight of head, stem diameter and biomass. Study planting dates showed that between cultivars was no significant for grain yield, but with delayed planting, decreased stem diameter. The effect of sowing date was significant difference for thousand-grain weight and number of grains per head, so that delays in planting increased grain weight. That was due to reduced number of grains per head..

Keywords— Sunflower, Sowing date, Cultivars, Yield and yield components Introduction (*Heading 1*)

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INTRODUCTION:

Among the crops, oil crops are great importance as one of the largest sources of energy. These are being cultivated mainly due to the use of food and non food oils. In India, due to the high consumption of oils and high import from other countries is considered, thus oilseeds production and study and research in this area has increased . Now, sunflower is as one of the world's annual oil plants. World production of oils in sunflower is next tosoybean and canola [3, 13], but in Monad University is after the canola. Oil sunflower cultivars mainly have the branches with a head. Branching and multi heading have the negative effect on yield, but times of ripening of heads are different. Cold and freezing on an early spring planting of sunflower may result in damage to the terminal bud and thus multiple branching that, thus the grain yield will decrease. In fact, the economic yield is the conversion of natural sources including light, water and nutrients into usable products by plant communities. In sunflower, yield is determined by the proportions of the various components. Recognition the share and state of formation in each component are important in plant yield. Yield components of sunflower include numberof heads per unit area, number of grains per head and average grain weight [3, 5]. Sowing date under irrigated and rained cultivation are one of the most important in farming operations, which affect on yield and other characteristics of the Maintaining the Integrity of the Specifications.

(Sunflower plant-Helianthus Annuus in Monad University)

MATERIALS AND METHODS:

The experiment was performed in the research under agricultural dept. of *Monad University* (48º 31´ N and 34º 52´E, 1730 m above sea level), in Monad University , with temperature characteristics in table 1, on soils classed a Sandy loam during 2012. This location has cold and humid winters, moderate summers and with semi -arid and cold climate. Average annual evapotranspiration is 1408 mm, average rainfall of about 305 mm (meteorology office of Hamedan). Field of experiment was fallow before the sowing from two years ago. Before sowing, half of the nitrogen fertilizer (150 kg ha-1with Urea source) and ammonium- phosphate (200 kg ha-1) was used by hand broadcasting method. Residual urea fertilizer was used at 7 to 8 leaf stage of sunflower (150 kg ha-1). The test carried out a split-plot based on a randomized complete block design with 3 replications. Main plot were sowing date (20 May, 5 and 20 June) and sub-plots were six sunflower cultivars (*Pomar, Euroflor, Master, Sirna,*Azargol and Armaviruski). Lines spacing and between plants were 50 and 20 cm, respectively. *Irrigation was* during the growing season with siphon every 6 to 8 days. For measurements the various components of the *plant including* stems and leaves, and seed heads were ten plants of each plot. Samples were dried in oven at 70 °C for 72 h. Thousands grain weight was performed with using of seed counter. For data analysis was used SAS software and the Duncan test at 5% level.

Table 1. *Average air temperature and rainfall during the seasons from 2010-2016 at Monad University Campus ,Hapur*

Month	*Oct*	*Nov*	*Dec*	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*
Rainfall (mm)	*0.34*	*71.74*	*34.00*	*19.50*	*36.38*	*30.20*	*50.72*	*45.68*	*2.42*	*3.08*	*0.00*	*4.16*
Average temperature (o C)	*15.7*	*7.6*	*2.9*	*-1.0*	*-1.0*	*5.0*	*9.8*	*14.1*	*19.7*	*24.0*	*24.8*	*21.6*

RESULTS AND DISCUSSION

The results showed that between genotypes there is a significant difference for the diameter of .Maximum and minimum of head diameter were Euroflor (18.8 cm) and Master (14.6 cm), respectively. This is consistent with results Dixon and Lutman that reported the effect of genotype on the size of head diameter was the most compared to sowing date. Although Tanimu et al., reported that delay in sowing date significantly reduces the head

diameter. Probably due to the different cultivars and weather conditions the locationof experiment. In between the grain yield with head diameter, thousands grain weight no. grain weight was positive correlation, and between thousands grain weight with no. grain weight was negatively correlated (Fig. 1). Reported that head diameter is positively correlated with grain weightper head. Marinkovic reported a significant and positive correlation between the number of grains and head diameter and thousands grain weight. Results showed that there is a significant difference in yield between cultivars. The maximum and minimum of grain yield obtained at Euroflor (556.3 g m-2) and master (375.9 g m-2), respectively. It seems, superior varieties in terms of yield due to high leaf area duration of reproductive phase, fast Physiological grow, sending enough assimilate to reproductive organs and ultimately benefit from the environment.Stem diameter between the sowing dates and the interaction of cultivars and varieties, sowing dates was a significant difference. The highest of stem diameter obtained at Euroflor compared to other cultivars. Sowing date (20 May) has maximum for stem diameter compared to 5 and 20 June. Stem diameter was reduced with delay in planting. Ishida et al., in their studies reported the stem diameter reduced with delay in planting. With delays in planting decreased stem diameter, Pomar, Master and Sirna, but increased Armaviruski cultivar. The results indicated that there are very significant differences between cultivars in plant height. Stem height was highest at Azargol (149.6 cm) compared to othervarieties. The results of the analysis indicated that there are significant differences between cultivars for biological yield Maximum and minimum of biological yield obtained at Euroflor (1394.4 g m-2) and Master (949.1 g m-2).

Acknowledgment

In general, the results of this test showed that between sowing dates were no significant difference for yield and yield components (except grain per head, thousands grain weight and stem diameter). All of traits decreased with delay in planting. Between genotypes, head diameter, stem diameter, stem height, grain empty, head dry weight, leaf and stem dry weight, grain yield and biological yield were significant difference. Euroflor and master were maximum and minimum in grain yield and biomass, respectively. Interaction sowing date and cultivar was no significant difference (except stem diameter).

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