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Effect of Irrigation Intervals, Black Plastic Mulch and Biofertilizers on Quantitative and Qualitative Characteristics of Pumpkin (*Cucurbita pepo* L.)

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Introduction: Pumpkin (*Cucurbita pepo* var. Styriaca) is one of the medicinal plants belonging to the Cucurbitaceae family. It is valuable in terms of seed oil and its fatty acids. The seed oil of this crop is widely used in the pharmaceutical industry. Reduction of agrochemicals (herbicides and fertilizers) is considered as research priority in medicinal plants production. Therefore, the selected practices and inputs should be environmentally sound, cost-effective and lead to high yield. Because of large inter-row space in pumpkin field, there is vast area of the bare soil which leads to weed establishment and loss of soil moisture. It seems that black plastic mulch protects soil moisture and controls weeds, thus increases seed yield. Also, biofertilizers due to available micronutrients, solubility of phosphorus, biological nitrogen fixation and phyto-hormones production increase the yield and improve the quality characteristics such as the seed oil and seed protein content. Therefore, in this research, the effect of black plastic mulch and biofertilizer on yield and quality of pumpkin under different irrigation intervals were studied.

Materials and Methods: This experiment was carried out as split plot factorial based on randomized complete block design with three replications at Agricultural Research Station, Bu-Ali Sina University of Hamedan during 2013 growing season. Treatments were included two irrigation intervals (I_1: 7 days and I_2: 12 days interval), black plastic mulch in two levels (M_1: mulch and M2: no mulch), and four fertilizer regimes (F1: Supply 25% of nitrogen and phosphorus requirements of plants from chemical sources (urea + triple super phosphate) + biofertilizers (nitroxin+bio-phosphate), F2: Supply 50% of nitrogen and phosphorus requirements of plants from chemical sources + biofertilizers, F3: Supply 75% of nitrogen and phosphorus requirements of plants from chemical sources + biofertilizers and F4: Supply 100% of nitrogen and phosphorus requirements of plants from chemical sources). , Biological yield, fruit yield, seed yield, harvest index, seed oil percent and oil yield, seed protein percent and protein yield and fatty acid profile were measured in the end of growing season. Harvest index was calculated by dividing the seed yield to biological yield. The seed oil was extracted **by** using the Soxhlet method and seed protein content was measured by Kjeldahl method. Fatty acids profile were also determined using gas chromatography device (GC) based on Metcalf *et al.* method. Data were analyzed by using the statistical analysis system (SAS, Ver. 9.2) and means were compared with LSD test at the 5% level of probability.

Results and Discussion: Results indicated that more traits of pumpkin were affected by three way interaction. The highest biological yield, seed and oil yield were obtained in the $I_1M_1F_3$, $I_2M_1F_3$ and $I_2M_1F_3$ treatments, respectively. 12 day irrigation interval, using of black plastic mulch and 75% chemical fertilizers + biofertilizers application had the highest protein yield (364.05 kg per hectare). Using of biofertilizers with supply 75% of the nitrogen and phosphorus requirements of plants from chemical sources, provided proper nutritional conditions for plant growth and increased fruit and seed yields. Also, using of black plastic mulch with 12 days irrigation interval increased yield due to the maintenance of soil moisture and weeds control. The major fatty acids in seed oil were unsaturated. The amount of unsaturated fatty acids such as linolenic acid (0.1 to 0.25 %), linoleic acid (36.5 to 57.44 %), oleic acid (21.5 to 39.5 %), and saturated fatty acids including palmitic acid (8.5 to 14.5%) and stearic acid (5 to 7%) were variable. Other fatty acids in seed oil of pumpkin were including arachidonic, myristic, and palmitoleic acid.

Conclusions: The results of this study indicated that $I_2M_1F_3$ treatment could be introduced as the superior because in the circumstance of this treatment, chemical fertilizer decreased by 25%, weeds were controlled non-chemically and maximum fruit, seed and oil yield with 59554, 1559 and 731 kg per hectare, respectively, were

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obtained with less water amount. Seed oil of this treatment had 33.89% oleic acid and 44.9% linoleic acid in its fatty acid profile, which could be considered as a high quality oil. Therefore with correct management of inputs such as the replacement of chemical fertilizers by the biofertilizers, reducing water consumption and non-chemical weed control using mulch, acceptable yield will be achieved and our agroecosystem would be closer to sustainable production and development.

Keywords: Biophosphate, Fatty acid, Harvest index, Mulch