Effects of heat stress on quantitative and qualitative yield of potato cultivars in winter and summer planting systems under field conditions

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Extended Abstract

Shojaei, K., Rakhshandeh, A., Sarchahi, H., Moghimzade Mohebi, M., Anahid, S. Effects of heat stress on quantitative and qualitative yield of potato cultivars in winter and summer planting systems under field conditions **Applied Research in Field Crops Vol 32, No. 02, 2019- Page: 16-18:** 108-129(in Persian)

Introduction: Potato (*Solanum tuberosum* L.) is the world`s fourth most important food crop after corn, rice and wheat (Trapero- Mozos *et al*., 2017). Due to the effects of global warming, it is expected that most of the areas under potato cultivation will be exposed to extreme temperatures in the upcoming decades (Hijmans, 2003). Based on current climate-crop models and climate change scenarios for the period from 2040 till 2069, a temperature increase of 1.3 to 3.2 °C is projected to occur in the areas where potato is grown, which will result in 18 to 32 % decrease in potato global production if the current potato cultivars and plantation dates are continued to be used. However, this expected decline can be reduced to 9 to 18 % by using adaptable potato cultivars and choosing proper planting dates. Due to its diverse climate, it is possible to grow potato across different areas and seasons in Iran. But, because of rising temperatures in many production areas of potato in Iran, particularly in those areas where the growing season takes place in spring, potato production can be associated with the risk of yield decline. The aim of the investigation was to evaluate the effects of heat stress due to winter and summer planting dates on quantitative and qualitative yield of potato cultivars and also explore the possibility of winter and summer cropping of potato in Boshruyeh region.

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Materials and Methods: Two independent experiments were performed based on a split plot design arranged in a completely randomized block layout with three replications in the years 2015 and 2016. The first experiment (summer cropping) consisted of three planting dates (Feb. 9, Feb. 23 and Mar. 11) as main factors and three cultivars (Fontaneh, Picasso and Santeh) as sub factors. The second experiment (winter cropping) consisted of the same cultivars as the first experiment with three different planting dates (Aug. 11, Aug. 26 and Sep. 15). During the growing season, cultivars growth stages and height were recorded once per two weeks. At the end of the growing season, 10 m^2 from the middle of each sub plot was harvested and yield and number of tubers as well as their weight (large tubers greater than 55 m, medium tubers between 35 and 55 mm and small tubers less than 35 mm) were measured. Data analysis was performed by MSTAT-C statistical software and graphs were drawn by Excel software.

Results and Discussion: The results showed that the potato tuber yield was affected by winter planting dates. The total tuber yield at the winter sowing date of Mar.11 was significantly 62 and 57 % lower than that of Feb. 9 and 23 sowing dates, respectively. However, there was not any significant difference in the total tuber yield between Feb 9 and Feb 23 sowing dates. The cultivar Santeh with an average yield of 2700 kg/m^2 gave 17 and 25 % higher yield than Fontaneh and Picasso cultivars, respectively. Interaction effects of planting date and cultivar revealed that the highest yield in winter cropping was obtained from Santeh cultivar at the first planting date (Feb.9) whereas the lowest yield was related to Fontaneh cultivar at the last sowing-date (Mar.11). The potato tuber yield was also affected by summer planting dates. Delaying planting date from Aug. 11 to Aug. 26 and to Sep. 15 resulted in significant drop of 20 and 46 % in total tuber yield, respectively. The tuber yield decrease (32 %) arising from the difference in the summer planting dates of Aug 26 and Sep. 15 was found to be statistically significant. The interaction between summer planting date and cultivar showed that the highest obtained yield was related to Fontaneh and Picasso cultivars at the first planting date (Aug. 11) and the lowest yield was recorded with the all three cultivars at the last summer-planting date (Sep. 15). It seems that the delayed cropping increased the limiting effects of high temperatures on tuber growth, which resulted in reduced yield at the late winter sowing date (Mar.11). Under high temperature conditions, changes in enzymatic activities can negatively influence carbon metabolism, starch accumulation and sucrose production (Ruan *et al.,* 2010).

Key word: planting date, tuber weight, tuber number, temperature

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