Abstract

In order to evaluate spring potato cultivation under different water and fertilizer management and comparing its ecological-economic aspects with wheat and melon, a field experiment was conducted in Hirmand city during two years of cultivation of 2015 and 2016. The first year experiment was split factorial in a randomized complete block design and second year experiment was, split plot in a randomized complete block design with three replications. The main factor in the first experiment was the potato cultivars in four levels (Sante, Satina, Arinda and Milva) and the sub plots of water stress at three levels (50, 70 and 90% of crop capacity) and different levels of ascorbic acid in four levels (zero, 10, 20 and 30 mM). The best yield, water stress and ascorbic acid levels were selected for performance in the second year. In the second year of the experiment, the main factor included 7 levels of fertilizer including 1)100% NPK fertilizer 2) vermicompost (20 tons per hectare) 3) manure (40 tons per hectare) 4) nano fertilizer 5) a combination of 50 percent NPK + 50 percent vermicompost 6) 50 percent NPK + 50% of manure and 7) 50% NPK fertilizer + 50% of nano fertilizer and different levels of methanol at four levels (0, 10, 20 and 30 volumetric) were considered as sub plots. Data analysis was performed using SAS software version 9.1 and mean comparison of treatments at 5% probability level. In order to investigate the ecological aspects of the design, the environmental impacts of three systems of potato cultivation, melon and wheat were evaluated using the LCA method. For this purpose, all environmental resources and diffusion in the production process and their environmental impacts in the form of six groups of effects of global warming, acidification and eutrification terrestial, deplation of fossil, phosphat and water resources in the categories of the quantifiable effect and, finally, the environmental index (EcoX) was calculated. Finally, economic indicators were estimated in three systems of potato cultivation, melon and wheat. The results of the mean comparison of interactions in the first year showed that Satina cultivar had the highest average tuber yield, small tuber yield, total yield (23.58 tonne per hactar) and highest harvest index and water use efficiency in 70% crop capacity and 20 mM ascorbic acid application . Also, this cultivar had higher values for some of its qualitative traits and antioxidant content including carbohydrat, catalase and ascorbate. The results of the comparison of mean interactions of the second year showed that in a combination of NPK + nano fertilizer and 20% volumetric foliar application highest dry weight of plant, water use efficiency, large tuber yield, total tuber yield (28.08 tonne per hactar). The results also showed that, for quality traits and antioxidant enzymes, the highest amounts ascorbate and the lowest catalase and peroxidase were obtained. The results showed that the highest total ecological impact was obtained with 0.53 EcoX per one ton of economical yield related to wheat production and the lowest amount was related to potato production with 0.15 EcoX per one ton of economical yield. The total RDI was calculated 0.47, 0.25 and 0.19 for one tonne of wheat, melon and potato, respectively Related to depletion of water resources. By calculating the ecological index, the highest environmental impacts with 1.4 EcoX per ton of wheat economical yield and the lowest with 0.44 EcoX per ton of economical yield were obtained in the potato production system, which had the highest share with The average of 38% belonged to depletion of water resources index. In order to reduce environmental effect in Sistan region, Optimal land leveling and new irrigation methods to improve the water efficiency and plant selection with less environmental effects in the planting pattern program.In the analysis of economic indicators, it can be stated that the highest gross return and net return of production related to the system of melon crops were 104.5, 111 million Iranian rials per hectare, respectively.

Keywords: Ascorbic acid, Drought stress, Economic index, Environmental effects, Methanol foliar application, Organic fertilizer.

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Thesis Submitted in Partial Fulfillment of the Requirement for the Degree of PhD in Agroecology

Title:

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January 2019