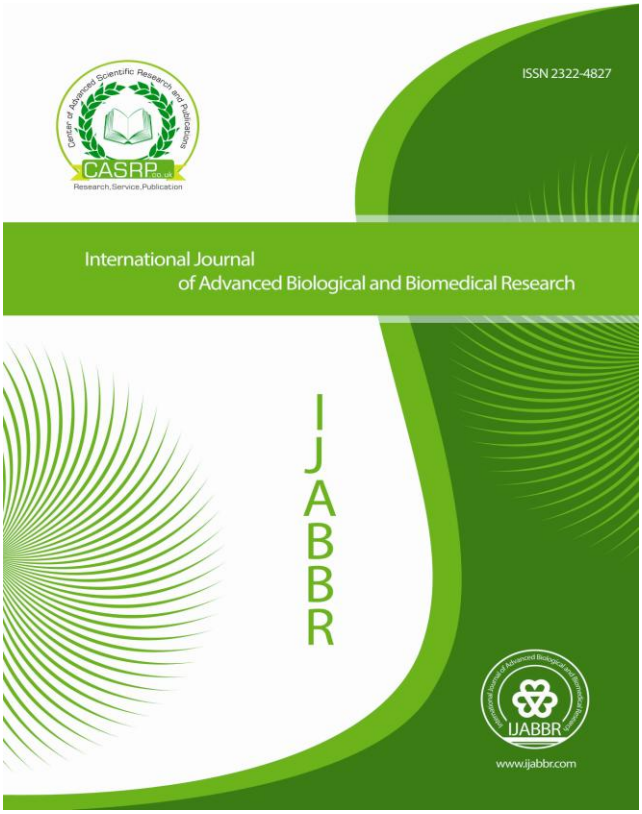

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CASRP PUBLISHER

International journal of Advanced Biological and Biomedical Research 4(1) (2016) 62–67

doi: 10.18869/IJABBR.2016.62

Original Article **Open Access**

Evaluating yield and some traits of potato in prevent freezing cropaid of Jiroft area

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Abstract

In order to finding cultivars with high yield and compatible with potato in the form of fall cultivation in jiroft area, an experiment in randomized complete block design with three replication, was done in Jiroft agricultural research center in 2013. In this experiment height plant, No. Stem, Tuber diameter, Tuber weight/plant, No. tuber and yield were examined. Effect Prevent Freezing Cropaid of potato significant ($p<0.01$) on No. tuber, yield, Tuber diameter, No. stems, Tuber weight/plant and height plant. Results of the mean data comparison, indicate that the No. tuber, yield, Tuber diameter, No. stems, Tuber weight/plant and height plant during the test was related to the observer T_1 (Use anti-freeze in time the seed tubers and green plant complete) treatment. From the obtained results, it was concluded that Use anti-freeze in time the seed tubers and green plant complete with a high regrowthing potential after freezing stress can be recommended in autumn culture in jiroft region.

Keywords: Component yield, Prevent freezing cropaid, Potato, Tuber diameter.

1. Introduction

Potato is one year old plant and its scientific name is *Solanum tuberosum* L. and is from tomato family (*Solanaceae*) and autotetraploid with 48 chromosomes (Imani and Rasooli, 2006). Potato, due to having high nutritional value, is considered as a very important crop in feeding the developing countries of the world. In Iran

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Received 13 December 2015 | Accepted 12 January 2016 | Available online 19 January 2016
iThenticate screening 16 December 2015 | English editing 10 January 2016 | Quality control 16 January 2016

due attention to the growth of population all over the country, food preparation for 65 million people at present and 120 million people in two future decades must be considered totally all the time. Therefore, increasing efficiency and more profitability of the strategic crops such as potatoes seems necessary to create nutritional health. To get this goal, performance increase in per unit considering the effective parameters on it has always devoted to apart of the researches related to potato. Potatoes yield against cereal yield (grain dry weight per unit area) are expressed wet weight per unit area (Wiersema, 1985). Potato yield is very high in per unit area and it has been in the second place after maize from cultivation level extension point of view and it is the second simple nutritional source after egg (FAO, 2007). Potato is the fifth agricultural product in the world after wheat, rice, maize and barely. The cultivated area of this plant in the world reached to about 2 million hectares and its production reached to 324.49 million tons (Roodbar-Shojaei *et al.,* 2008). Potato cultivated area in Iran was about 189670 hectares in 2005 and its production was 4830000 tons with a yield equal to 25763kg h^{-1} (Anonymous, 2002). It must be mentioned that more than 100 countries out of the total number stand in tropical and semitropical areas. However the most production is focused in temperate zones of industrial countries. With due attention to climate variety in Iran, there is a lot of potential to plant this crop. More than 82% of the produced crop is presented to the markets in August, September, October and November which is produced in cold and temperate areas and the rest of it is produced in tropical and semitropical zones which are distributed at the end of winter and the beginning of spring. Since tropical areas like Jiroft have the capability to be cultivated out of the season, like September or October, harvesting them in winter can reduce its shortage (Alavi-Shahri and Zahedi-Aval, 1995). Potato cultivation in the cold areas of the Iran such as Hamedan, Ardabil and etc with the specific traits of the mentioned areas has been a stable cultivation for the farmers, while in the southern areas of the country in which they plant this crop in August, September and October to continue its production, there are specific conditions which oppose the conditions of cold areas. For example in cold areas, after cultivation the days are gradually warmer and longer but in tropical areas after cultivation the days become hot and difficult conditions appear because the days get colder and shorter little by little. Autumn cultivation of potato is done in January, February and March in order to fill market loss. Also less storage costs and fresh crop are the factors that can be gotten in autumn cultivation. Annual cultivation of 165000 hectares of potato in Iran and reaching to nutritional health and avoiding crop price vacillation necessitates that in all seasons and in all cultivable areas, a proper seed of compatible species of the same area is available (Alavi-Shahri and Zahedi-Aval, 1995). The main objective of the present work was to study the effects of different Prevent Freezing Cropaidon the yield of *Solanum tuberosum* L.

2. Materials and methods

The experiment was carried out in 2013 in the field of agricultural research centre of Jiroft which has warm and almost dry climate (Tables 1 & 2). Soil texture of the experiment place was sandy - loamy with an EC equal to about 1.20 ds/meter and its PH was equal to 7.6. The results of soil analysis which has been done on the soil sample by soil laboratory in Jiroft agricultural studies centre have been stated in Table 3. To cultivars which have high yield and are compatible to be cultivated in autumn in Jiroft, Satina potato cultivar were evaluated. Tubers of these cultivars were provided from agricultural research centre.

This research was conducted in a completely randomized design with factorial form. Factors used Prevent Freezing Cropaidincludes three levels: (T_1: Use anti-freeze in time the seed tubers and green plant complete. T_2: Use anti-freeze time interval in 7 days. T_3: Do not use anti-freeze) (beginning gland enlargement (based on specific stages of potato growth by rowe)

Table1
Monthly rain and relative humidity amount during potato growth season in Jiroft in 2013 (Jiroft weather forecast statistics).

Month	Sep-Oct	Oct-Nov	Nov-Dec	Dec-Jan	Jan-Feb	Feb-Mar
Rain (mm)	6.3	0	0	12.6	1.7	14.7
Relative humidity (%)	36	41	59	56	55	40

Table 2
Monthly maximum, minimum and mean temperature during potato growth season in Jiroft in 2013 (Jiroft weather forecast statistics).

Month	Sep-Oct	Oct-Nov	Nov-Dec	Dec-Jan	Jan-Feb	Feb-Mar
Maximum temperature (0C)	41.2	37.5	28.9	22	20.8	21.9
Minimum temperature (0C)	23.6	20	12.8	7.8	6.1	8.2

The experiment was done in the form of random complete blocks design with three repetitions. In each experiment unit, there were four lines of cultivation with five meters length with distance 75 cm, 25 cm plant spacing in the row and the distance between repetitions of the 1.5 m were considered. Land preparation was done in October that included plow and disk. Then the action was taken to make rows according to the cultivation plan. According the results of soil test, 250 kg h^{-1} nitrogen was used and 150 kg h^{-1} of ammonium phosphate was consumed and kg h^{-1} of potassium sulfate was used. Nitrogen fertilizer was used in two stages: 1.2 stage when 75% of the bushes were green and 1.2 before flowering. The cultivation was done on 25 October 2008. It was done manually and by means of the tubers that had passed sleeping period and had buds. They were cultivated in the depth of 20cm. When the leaves got dry and yellow and it was assured that the tubers were completely ripe, harvesting operation was done in January on February. Measuring the traits was done from two lines from the middle and by taking away 0.5 meters from the beginning and 0.5 meters from the end of the line. In each experimental unit, 5 bushes were selected to be measured from the considered traits points of views. The studied traits were measured on the average base of 5 bushes. To do the statistical analysis of the resulted data, SPSS and Path Analysis software's were used.

Table 3
Soil features of experiment place in 2013.

Total nitrogen (%)	Absorbable (ppm) phosphorus	Absorbable (ppm) potasium	Soil texture	EC (ds/m)	pH	Depth(cm)
0.20	7.9	179	Sandy - loamy	1.20	7.6	30 -0

3. Results

Effect of Prevent Freezing Cropaid significant ($p<0.01$) on heightplant (Table 4). Results of the mean data comparison, indicate that the maximum height plant during the test was related to the observer treatment T_1 (Use anti-freeze in time the seed tubers and green plant complete) (Fig 1).

Effect of Prevent Freezing Cropaid significant ($p<0.01$) on No. Stems(Table 4). Results of the mean data comparison, indicate that the maximum No. stem during the test was related to the observer treatment T_1 (Use anti-freeze in time the seed tubers and green plant complete) (Fig 2).

Effect of Prevent Freezing Cropaid significant ($p<0.01$) on tuber diameter (Table 4). Results of the mean data comparison, indicate that the maximum Tuber diameter during the test was related to the observer T_1 (Use anti-freeze in time the seed tubers and green plant complete) treatment (Fig 3).

Effect of Prevent Freezing Cropaid significant ($p<0.01$) on tuber Weight/plant (Table 4). Results of the mean data comparison, indicate that the maximum Tuber weight/plant during the test was related to the observer T_1 (Use anti-freeze in time the seed tubers and green plant complete) and T_2 (Use anti-freeze time interval in 7 days) treatments (Fig 4).

Effect of Prevent Freezing Cropaid significant ($p<0.01$) on No. Tuber(Table 4). Results of the mean data comparison, indicate that the maximum No. Tuber during the test was related to the observer T_1 (Use anti-freeze in time the seed tubers and green plant complete) treatment (Fig 5).

Effect of Prevent Freezing Cropaid significant ($p<0.01$) on yield (Table 4). Results of the mean data comparison, indicate that the maximum yield during the test was related to the observer T_1 (Use anti-freeze in time the seed tubers and green plant complete) treatment (Fig 6).

Table 4
Variance analysis of evaluated traits in the studied potato.

S.O.V	DF	Mean Square					
		Height	No. stems	Tuber diameter	Tuber weight/plant	No. Tuber	Yield
Replication	2	24.08	0.521	2.317	225.6	8.99	15250
Prevent Freezing Cropaid	2	93.90 **	0.136**	21/37**	18687**	84.42**	204457**
Error	6	6	0.344	3.44	1912	1.94	32548
CV	%	3	18	9.5	22	19	12

**, * and ns, significant at 1%, 5% level of probability and non-significant, respectively.

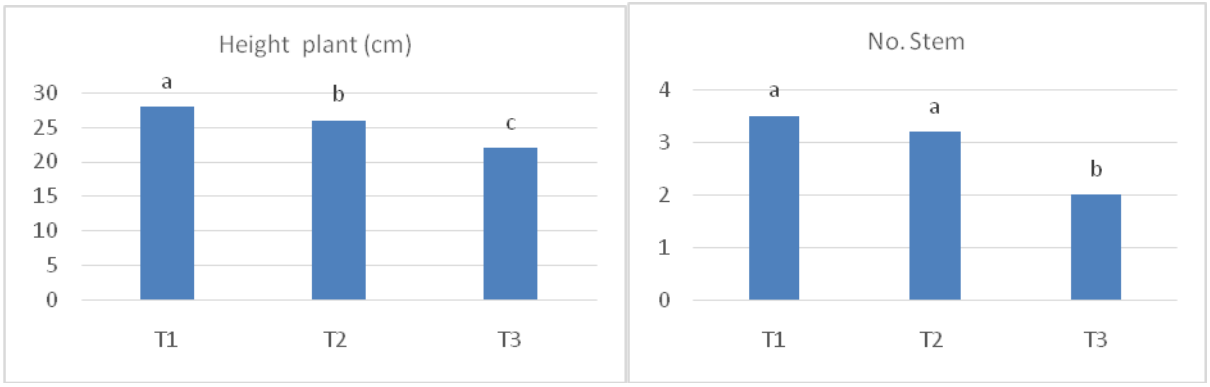

Fig. 1, 2. Effect of Prevent Freezing Cropaid on height plant and No. stem at *Solanum tuberosum*.

(T1: Use anti-freeze in time the seed tubers and green plant complete. T2: Use anti-freeze time interval in 7 days. T3: Do not use anti-freeze)
Each observation is a mean±SD of 3 replications
In each figures means with same superscripts had no significant difference with each other (P>0.05).

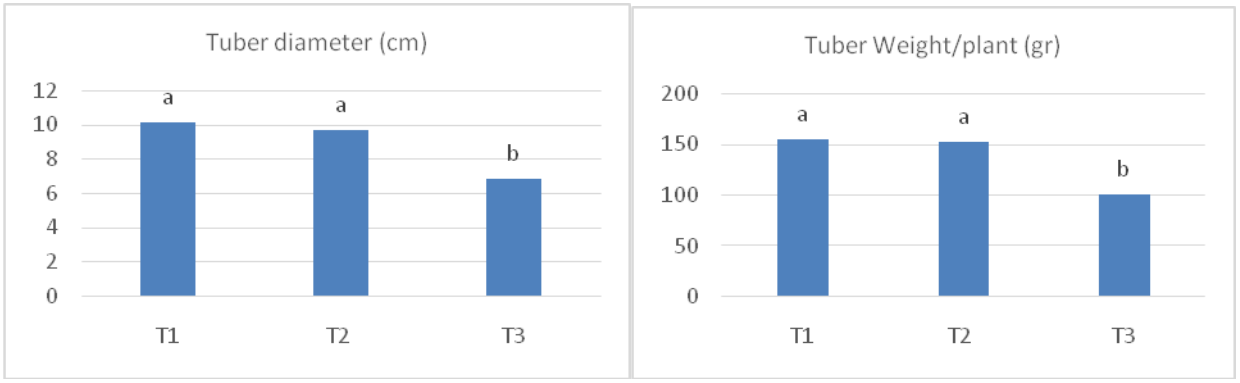

Fig. 3, 4. Effect of Prevent Freezing Cropaid on tuber diameter and Tuber weight/plant at *Solanum tuberosum.*

(T1: Use anti-freeze in time the seed tubers and green plant complete. T2: Use anti-freeze time interval in 7 days. T3: Do not use anti-freeze)
Each observation is a mean±SD of 3 replications
In each figures means with same superscripts had no significant difference with each other (P>0.05).

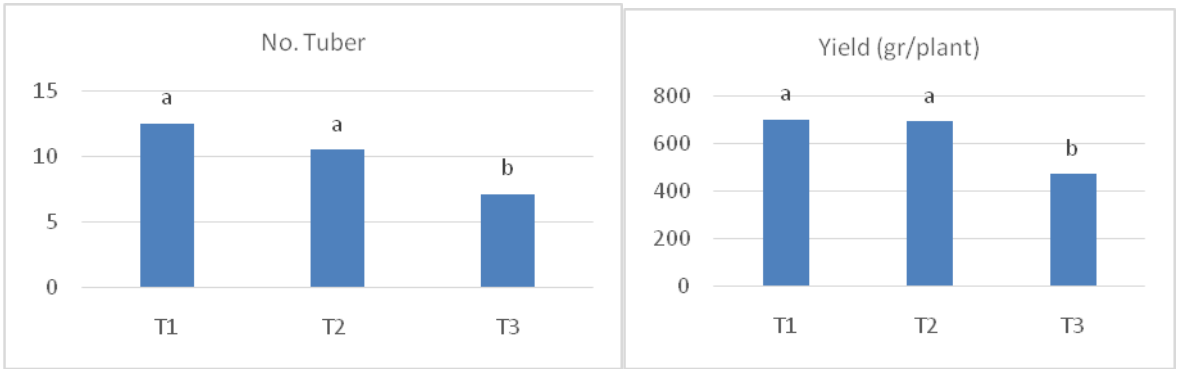

Fig. 5, 6. Effect of Prevent Freezing Cropaid on No. tuber and yield at *Solanum tuberosum*.

(T1: Use anti-freeze in time the seed tubers and green plant complete. T2: Use anti-freeze time interval in 7 days. T3: Do not use anti-freeze)
Each observation is a mean±SD of 3 replications
In each figures means with same superscripts had no significant difference with each other (P>0.05).

4. Discussion

Thorough understanding of the physiological responses of plants against environmental stresses, to apply new methods to reduce the effects of stress, is essential. Although the potato crop S.tuberosum are known to grow well in low ambient temperatures, however, necessary for optimum growth temperature range between C 25-20 and is sensitive to frost (Alleman et al., 2004), Frost or freezing temperatures may occur at any stage of plant growth Potatoes Outer nonfatal injuries shoot Howe leaves the plant. Potato because the potential for regrowth, compared to other plants react differently to show the damage caused by freezing (Lorenzen and Ewing, 1990). The risk of frost damage is prevented until cold resistant cultivars is a long way from the genotypes that are able to re-grow and produce freezing yield stress are the key to successful During the winter of in the southern part of the Iran (Alhassan et al., 1988).

Potatoes have a high capacity is regrowth. (Growth recovery after removal of foliage leaves is associated with environmental stresses) (Kratzke and palta, 1985). On the the verge of elimination the foliage emerges from the soil, plants, flowering, and after flowering phase which leads to a yield loss was calculated (Zander et al., 1995). According to reports potatoes are the greatest sensitivity to the cold, and caused a great reduction in flowering time performance. Damage in the early stages and after flowering is less effective in reducing of the performance. Because in the primary stages of growth, regrowth is possible (Franks, 1985; Hetherington et al., 1983). However, freezing temperatures, the ultimate performance can be effective at every stage of growth (Hetherington et al., 1983).

According to potato growth and developmental cycle can be divided into five stages, each of these developmental stages of growth are able to regrowth. Depending on the damage created by, stage of development varieties of potato as well as repair and produce an acceptable yield (Rowe, 1993).

5. Conclusion

From the obtained results, it was concluded that Use anti-freeze in time the seed tubers and green plant complete with a high regrowthing potential after freezing stress can be recommended in autumn culture in jiroft region.

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How to cite this article: Moosavi Sardoo, S.F., 2016. Evaluating yield and some traits of potato in prevent freezing cropaid of Jiroft area. International journal of Advanced Biological and Biomedical Research, 4(1), 62-67.