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Research article

THE HB-101, NITRAGIN BIOFERTILIZER AND UREA FERTILIZER EFFECT ON WEED INTERFERENCE IN POTATO (*SOLANUM TUBEROSUM*)

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ABSTRACT: Afield experiment was conducted to study the effects of Urea fertilizer, biofertilizer inoculation and application of HB-101(a completely organic natural extract) on weed interference, a field experiment in Factorial scheme based on Randomized Complete Block design in four replications. The first factor was tuber inoculation with Nitragin biofertilizer (a combination of *Azotobacter* species and *Azospirillum* species) at two levels: non inoculated and inoculated. The second factor was HB-101 (a completely organic natural extract) with three levels: non sprayed, one time and two times sprayed onto the potato foliage during the growing season. The third factor was chemical urea fertilizer with two levels: non-used (0) and used at rate of 500 kg/ha. In this experiment, the length of each plot was 7.5m. while 5 meters of each plots by hand had weeded and 2.5 meters of each plots keep the crop weed free for the entire growth period. At the end of grow age, from division of weed free by quadrate (0.5×0.5) in three points of each plots was sampling, and number of weeds and dry weight of weed were measurement. The results of this study revealed that there were significant ($P<0.05$) differences in the number and dry weight of weed between the different treatments during growth. Thus it is suggested to use a combination of organic and inorganic fertilizers to achieve the lowest density of weed without negative effect on grain quality that will lead to environmental conservation.

Keywords: potato, biofertlizer, urea, weed

INTRODUCTION

Potato (*Solanum tuberosum*) is one of the main and strategic products and stands in fourth position after wheat, rice and corn .It has also a special role in feeding people of under developed Countries [12]. Weed are one of the greatest threats to agricultural crop production. They use the soil fertility, available moisture, nutrients, providing shelter for insect-pest and compete for space and sunlight with crop plants which causes yield reduction. Apart from quantitative effects on yield weed deteriorate the quality of produce through the physical presence of their seeds and debris [4, 7 and 16]. The use of herbicides for weed control, however, is too uneconomical in addition to resulting in serious ecological and environmental problems such as increase in herbicide resistance in the weeds, ground water contamination and environmental pollution [1, 2, 9 and13]. One of the suggested ways to control weed in crops is to improve the ability of the crop itself to suppress weed and fertilization management is an important factor in optimizing crop production and increasing crop competition ability for weed management [7]. Reduction of yield and its components with weeds infestation is documented by many researchers [3, 4, 6 and 16]. Increasing and extending the role of biofertilizers can reduce the need for chemical fertilizers and decrease adverse environmental effects. They can play a significant role in fixing atmospheric N and production of plant growth promoting substances. Therefore, in the development and implementation of sustainable agricultural techniques, biofertilization has great importance in alleviating environmental pollution and deterioration of nature [8, 11 and 15].

Azotobacter sp. and *Azospirillum sp*. are used as biofertilizers in the cultivation of many agricultural crops. The estimated contribution of these free-living N fixing prokaryotes to the N input of soil ranges from 0–60 kg/ha per year [17]. Existence of microbial communities like *Azotobacter spp*. and *Azospirillum spp*. in the rhizosphere promotes the growth of the plant through the cycling and availability of nutrients, increasing the health of roots during the growth stage by competing with root pathogens and increasing the absorption of nutrients and water [5, 17 and 18].
HB-101 is an organic plant growth promoter that is specially processed by blending the extracts of cedars, pines, cypress trees and plantains. Cedars, pines and cypresses are long-lived trees with powerful deodorizing power. The saps and secondary metabolites of these trees are responsible for maintaining the health and longevity of the trees. Plantains are known to have medicinal qualities and have long been used for various human medications. HB-101 is a growth nutrient for plants, flowers and crop production and it is not a chemical fertilizer. That is a 100% organic product, safe for plants and animals, and designed to benefit the earth's environment while reducing the demand for costly fertilizers [13].
It is important to develop integrated fertilization strategies for crop production that enhance the competitive ability of the crop, minimize weed competition, and reduce the risk of nonpoint source pollution from nitrogen. Moreover, it seems that there is little investigation on combined effects of organic (Nitragin and HB-101) and inorganic nitrogen fertilization under different rates of weed interference in some crops such as potato. Hence, considering the above facts, the present study was undertaken to study the effects of various rates of mineral nitrogen fertilization and biofertilizer (*Azotobacter sp*. and *Azospirillum sp*.) inoculation on weed interference.

MATERIALS AND METHODS

The experiment was carried out at the experimental field of in Iran (3408' N, 46026' E, Altitude: 1365m), Table 1 shows some of the soil characteristics:

Table 1: Soil parameters of the experimental field.

Loam (%)	Sand (%)	Clay (%)	Organic (%)	PH	K (ppm)	P (ppm)	Tissues	Deeps(cm)	
35	22	43	0.98	7.9	380	8.6	Clay	0-30	

The potato cultivar was Marfona that is extensively grown in the region. The experiment was a factorial with three factors arranged in a randomized complete block design with four replications. Factors including biofertilizer two levels: control (no tuber inoculation) and tuber inoculated with a Nitragin, that is a biofertilizer containing *Azospirillum Spp* and *Azotobacter Spp.* urea two levels: control (0kg/ha) and application (500 kg/ha) and the HB-101 three levels: non-use, once sprayed and twice sprayed.
Before planting, potato tubers were immersed in nitragin solution for 30 to 50 minutes under dark conditions. Then they were planted in with 25×75 cm and each plot was a 7.5m long, 5-row. Tubers were placed at 10-15 cm depth in each row. Urea chemical fertilizer (500kg/ha, according to the soil test recommendation) was applied at two stages before planting and flowering. HB-101 solution (1/1,000 v/v) was sprayed on the potato plants at (7-10 leaf stage) and flowering stages time. Mechanical control was used for weed control of 5 meters in long of each plots. No weed control was done for 2.5 meters in long of each plots to weed interference throughout growth period of potato plants.
At the end of from the experiment weed free division was sampled by quadrate (0.5×0.5) in three points of each plots, then dry weight and number of weed were measured. Plants were irrigated (weekly).
Analysis of variance was carried out using SAS computer software packages. The comparison of means was investigated using LSD at 0.05% probability.

RESULTS AND DISCUSSION

There is represented the effects of N fertilization, biofertilizer inoculation on dry weight and number of weed in Table 2. The results indicated that nitragin and HB-101 had significant effect on all of the studied traits. Furthermore, nitragin×HB-101interaction was significant in dry weight and number of weed.
It is important to develop integrated fertilization strategies for crop production that enhance the competitive ability of the crop, minimize weed competition, and reduce the risk of nonpoint source pollution from nitrogen.

Table-2: Analysis of variance of the traits under study.

		Mean square	
Source of variance	df	Number of weed (N/m^2)	Dry weight of weed (g/m^2)
replication	3	6	72.94
Urea(U)	1	76^{**}	42.76^{*}
Nitragin(N)	1	75^{**}	28.87
HB-101(H)	2	1.75	4.31
U×N	1	14.08	17.34
U×H	2	31^{*}	80.88^{**}
N×H	2	29.25^{**}	24.77
U×N×H	2	20.58	77.96
C.V (%)	-	20.39	27.28

* and **: Non significant and significant at the 0.05 and 0.01 level of probability, respectively.

The number of weed was significantly affected by urea application, biofertilizer inoculation, interactions between Nitragin×HB-101 and urea ×HB101 were (Table 2). The highest number of weed was observed in non used of urea (0kg N/ha) and non sprayed of HB-101(control) that did not differ significantly with non used of urea and tow sprayed of HB-101. The minimum number of weed was recorded in used of urea (500kg N/ha) and tow sprayed of HB-101 . Application of HB-101 reduced number of weed compared to control (Table3). Moreover, number of weed was observed in inoculated plants and tow sprayed of HB-101 were lowest than non-inoculated plants (Table 4).

Table 3. Means comparison of the Urea×HB-101 interaction for the Number of weed.

	Urea	
	Used	No Used
HB-101/ non sprayed	14.1ab	14.3a
HB-101/ one sprayed	13.2ab	15a
HB-101/ two sprayed	10.8b	16.3a

The same letters at each column indicate the insignificant difference at the 0.05 level of probability. (LSD test).

Table 4. Means comparison of the Nitragin×HB-101 interaction for the Number of weed.

	Nitragin	
	Inoculation	No- inoculation
HB-101/ non sprayed	15.3a	15.1a
HB-101/ one sprayed	14.2a	13.7b
HB-101/ two sprayed	11.7b	13.5b

The same letters at each column indicate the insignificant difference at the 0.05 level of probability. (Duncan test).

Weed dry weight was significantly affected by nitrogen application and interactions between urea ×HB101 were (Table 2). Weed dry weight reduced with the increase of N application rate and sprayed of HB-101. The lowest and the highest values of weed dry weight were recorded in N application+ tow sprayed of HB-101 and N application + non sprayed of HB-101, respectively (Table-5).

Table 5. Means comparison of the Urea×HB-101 interaction for the weed dry weight(g/m^2).

	Urea	
	Used	No Used
HB-101/ non sprayed	120.23a	140.20a
HB-101/ one sprayed	100.48ab	135.6a
HB-101/ two sprayed	80.88b	130.66b

The same letters at each column indicate the insignificant difference at the 0.05 level of probability. (Duncan test).

These results demonstrated that weed infestation resulted probably caused by competition for available resources. Furthermore soil processes play a key role in 23 suppressing weeds, pests and diseases. According to the same experiment in this base wasn't, Methinks that the microelements (Fe, Mn, Mg,) with urea application increased of power competitive in versus of weed. Moreover, Inoculated of Nitragin potato plants had statistically less number of weed per meter square than non-inoculated plants. It seems that *Azotobacter sp*. and *Azospirillum sp*. increased the available nitrogen in the soil which could more fast than weed.

Also with urea application and tow sprayed of HB-101 had reduced weed dry weight may be reasons increased of power competitive and photosynthesize in versus of weed. Reduction of number and dry weight of weed in the presence of potato with integrated feeding due to plants competition for light and aerial resources as reported by Kolb and Gallandt [7] and that is probably related to hormonal changes in plant tissues. Management nutrients practices used affect more than one component, for example, cultivation may be beneficial for weed control but may stimulate mineralization of nitrogen when the crop does not require it. These results are in line with the findings of other researchers [1, 3 and 10].

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