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ORIGINAL ARTICLE

Investigating the Agroecological Characteristics of Hairy vetch and spring Barley in different Intercropping system

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ABSTRACT

In recent years with occurring monoculture problems including: pollution of water and soil and also reducing the productivity of farm land, lead to researchers' attention more than ever to maintain stability and fertility of agricultural production systems. One of the ways to enhance the stability is diversification through the use of multiple cropping systems. So, in order to evaluate intercropping of barley and vetch, a factorial experiment in a randomized complete block design with four replications was conducted during two consecutive years 91-92 in agricultural research station of Miandoab. Treatments were including: additive series of intercropping in mixed and raw form. Treatments of the experiment include A factor is the amount of hairy vetch in four levels 0, 250, 450 and 650 seeds per m², and B factor is the amount of barely in four density of 0, 300, 500 and 700 seed per m². Due to higher production, using of optimum densities in cultivation per unit area are recommended. According to results, the density of 500 barely per m² and the density of 250 vetch per m² which is not too high is recommended for planting. At low densities due to the unused space in the farm that is part of the earth and the great distance between plants causes the plants to grow with the least amount of competition all these factors, which may cause delay in the assessment and occurring treatment in the late season growth period with high temperatures and decreasing the yield and in higher densities than desirable causes the intense competition and limitation, thus the smaller seed production with law weight will be resulted, According to the results of the density of 500 barely per m² and the density of 250 vetch per m², which is not too high is recommended. Comparison of the mean interaction of the barely density and vetch density on barely yield in raw additive intercropping showed that, the highest seed yield was obtained in the density of 500 barely and the density of 250 vetch with the numerical value of 3.046 t per hectare And the lowest yield was obtained in the density of 300 barely and the density of 650 vetch with the numerical value of 1.350 t per hectare.

Key words: *Agroecological characteristics, hairy vetch, barley in different intercropping system*

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INTRODUCTION

Population growth and degradation of natural resources Followed by the urgent need to increase food production are today's underlying problems. Increasing crop yield in order to respond to the growing demand for food resources is essential. This has led to pressure on natural resources and threaten the sustainability of agricultural systems. Therefore, the need to design and implement high-performance of stabile systems gradually increased. One of the major principles of sustainable agriculture is to create and maintain diversity [1]. Moreover, rapid population growth and ever increasing demand for meat and dairy increased non-normative livestock in pastures and put too much pressure on them. Accordingly farmers and ranchers for their short-term needs, attempts to plow the meadows in unauthorized slopes and convert the pastures to low-yielding land And after a few years due to low yields, they had to leave. This activities in our country has led that Iran have the first ranks in terms of global soil erosion.

Furthermore, the increased number of livestock is more than feed production capacity. According to the above, increasing the fodder production, with preservation of natural resources seem to be necessary. In this regard, one of the components and ingredients associated with an increased sustainable production is intercropping system of Crop and pasture [2]. For optimal use of environmental factors (light, food and water) theoretically an ideal cropping pattern is needed, so that be able to fully occupy all possible ecological niches in the shortest time, For instance, absorb all nutrients and water element from the soil profile And be able to use light effectively. Perhaps achieving this type of cultivation be impossible in practice, but the more complete utilization of environmental resources, by biomimecry from samples in the nature Different plant species are cultivated together. These species have different ecological niches So that when they grow together, complement each other. Intercropping is as a part of crop rotation program in designing the sustainable agriculture system, In addition to increase the ecological and economic diversity, cause to increase the yield per unit area, Using resources more efficiently, reduce pest problems, increase system stability and more favorable nutrition of human and animal [3]. One of the major advantages of intercropping compared to monoculture is, in intercropping, plants that show more consistent together, almost most of the time increases the total yield per hectare, this is due to the reduction of competition between them. In recent years tend to intercropping cereals-legumes in temperate and tropic regions are increasing. Increasing desire to cultivate this type of intercropping may be due to many advantages of this system compared to monoculture. The more yield and increase soil fertility through nitrogen fixation by legumes is the most important case of these benefits [4] in intercropping of forage plants, choosing two species should be done in a way that they complement each other in terms of quality of food and cover each other's limitations, Thus by enjoying the benefits of intercropping can be achieved a complete forage. Intercropping to produce the forage, is an appropriate Selection to increase the Production performance and sustainability and to achieve a better quality forage in the system of low-input agriculture. The aim of this study was to evaluate the additive intercropping of barley and vetch forage in order to produce more and better quality forage compared with monoculture of these two plants, one of the ways to increase the efficiency of use of available resources and Increasing the yield per unit of land, with emphasis on aspects of environmental protection and Increasing the diversity and stability of biological and economical in the long run, is using the Multiple cropping methods, specially intercropping. Intercropping is dual culture of two or more species in determined time and place.

MATERIALS AND METHODS

This experiment was conducted to study the effect of intercropping of spring barley and vetch during two consecutive years 91-92 in Agricultural Research Station of Miandoab.

The specifications of experimental design

1. Treatments: Intercropping will be in additive and mixed series (row and mixed). A factorial experiment was done in a randomized complete block design with four replications. Factor A is the amount of hairy vetch seed used in four levels 0, 250, 450 and 650 seeds per m^2 , factor B is the amount of barely in the four density 0, 300, 500 and 700 seeds per m^2.

2. The planting was done in April 2013, the number of experimental plots in this study was in additive and mixed series (row) a number of 60 plots which each experimental unit with an area of 4.8 m^2, including 8 lines with a length of 3 m and line spacing was 20 cm. The distance between two plots was 1m and the gap between two Repetitions was 3 m. 1. The amount of used barley seed will be based on 500 seeds per m^2 and the amount of vetch will be 400 seeds per m^2. The first irrigation was done immediately after planting and the next irrigation was done According to climatic conditions on average every 7 to 10 days. Weed control operations were regularly carried out manually when necessary. In this experiment, the uses of any chemicals (fertilizers and pesticides) were avoided in both in preparing the land and during the growing season. The consumption of 50 kg of urea fertilizer were applied as a starter, 90 kg ha triple superphosphate in the preparation of the land.

Data analysis

Statistical analysis included analysis of variance was performed as a randomized complete block design. Average data was done using Duncan's multiple range tests at 5 percent. Statistical analysis was done using software's SPSS and MSTATC graphs were draw using EXCEL.

RESULTS AND DISCUSSION

Grain performance

The comparison of the interaction's density mean of the barely on the density of vetch on the performance of vetch in mixed additive intercropping showed that (Table 4-1). The highest grain yield

about 500 plants of barley And vetch with zero density numeric value 3.014 t ha And the lowest grain yield was barely plant with density of 300 plants and Vetch plant density of 650 plants with the numerical value of 1.463 t ha was obtained. Based on the results, the mean of interaction of barley yield in row intercropping showed that, the highest grain yield is related to barley in the second year with the density of 500 plants with the numerical value of 3.009 plants t ha The lowest yield is related to barley with the density of 300 plants ha in the first year with the numerical value is 2.197 tons. The comparison of mean density of the barely interaction vetch plant density on barley yield in a row additive intercropping showed that The highest grain yield was related to barely with the density of about 500 plants and the density of vetch with 250 plant with numerical values 3.046 t ha and the lowest grain yield was related to barely with the density of 300 plants and the density of 650 vetch plants with the numerical value of 1.350 t ha. The higher grain yield in the density of 500 seeds per m2 is Due to biological yield, Harvest index, as well as other premium features like High weight of 1000 grain and plant height in this density. Thus, any change in density cause the change in the performance of varieties [5, 6].

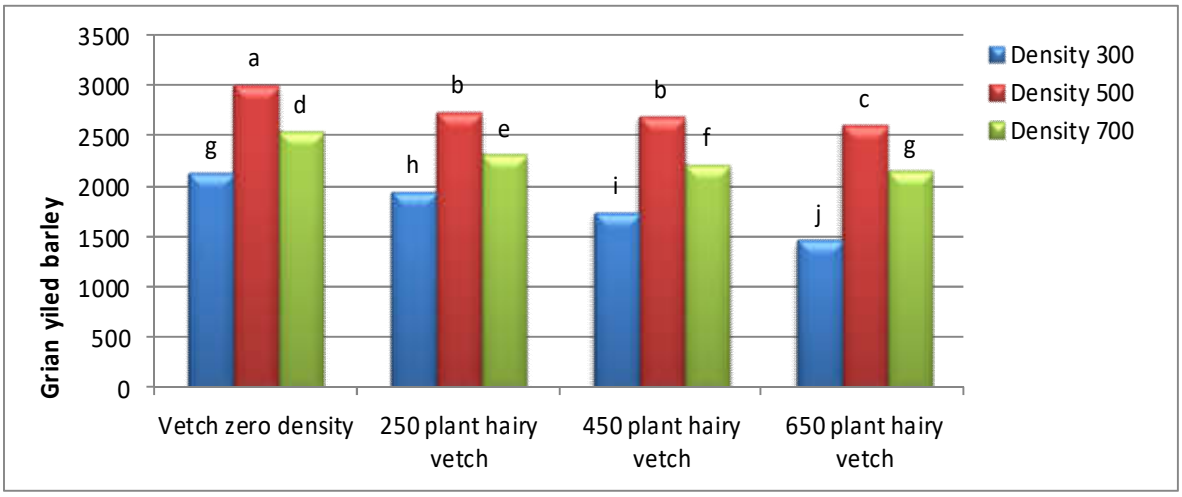

Figure 1: The Comparison of barley's density interaction on vetch density on barely yield in mixed intercropping

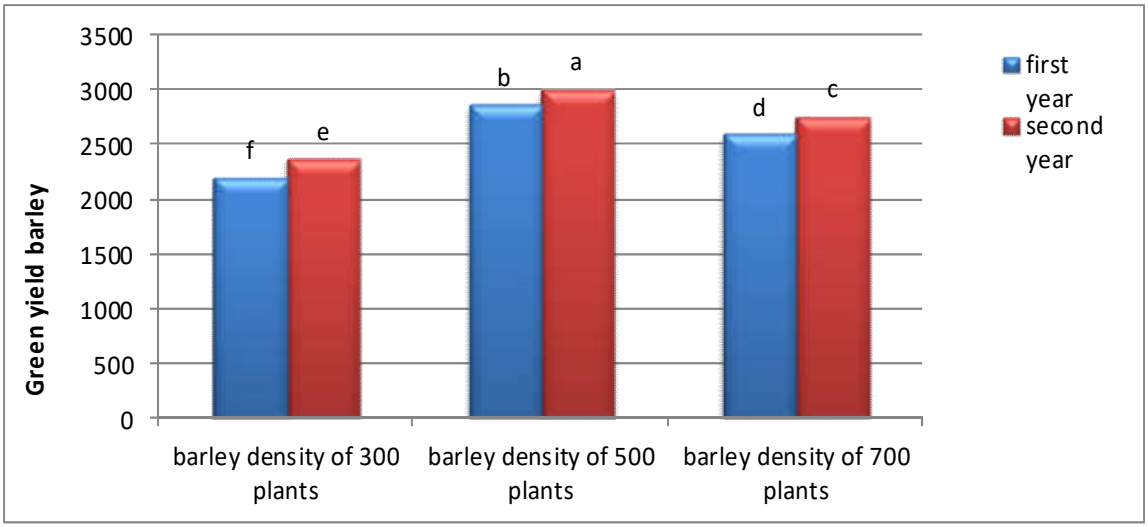

Figure 2. The Comparison of the interaction effects of year on barely yield in row intercropping

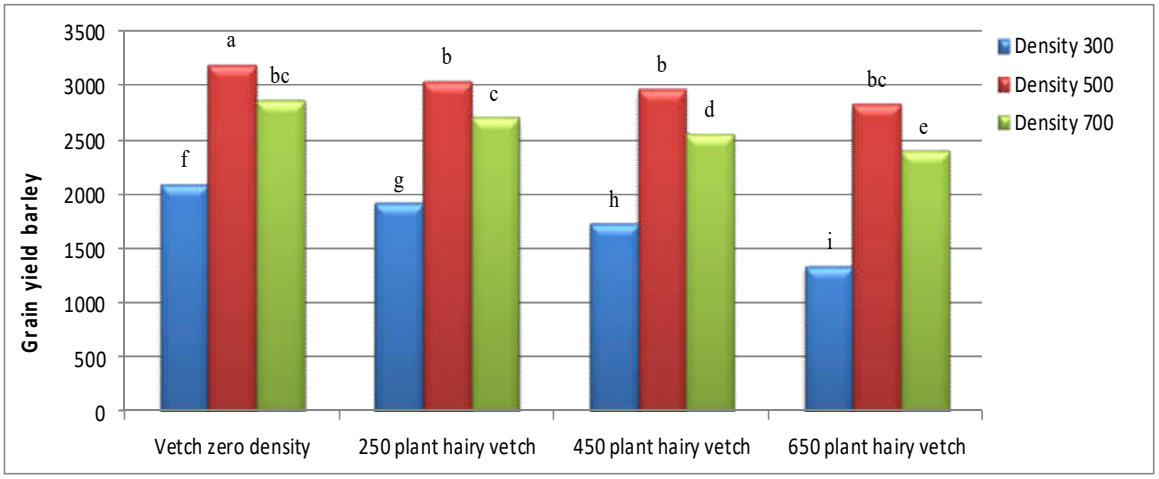

Figure 3. The Comparison of density interaction of barely on the vetch density in the performance of barley in row planting

Table 1: Analysis of mixed variance traits of intergrowth of barely-vetch in a factorial design based on randomized complete block

variation Sources	df	1000 grain weight	Barley biological function	Barely yield
Year (Y)	1	36.8^{ns}	793.7**	674.1**
Replication	3	25.2^{ns}	102.5^{ns}	442.8**
Vetch density	3	49.1^{ns}	868.9**	101.2^{ns}
Year in The density of vetch	3	22.5^{ns}	92.5^{ns}	78.5^{ns}
Barely density	3	186.1 **	835.4**	731.3**
Year in the density of barely	3	30.4^{ns}	68.8^{ns}	133.9^{ns}
Barley density in the density of vetch	9	17,5^{ns}	463.6*	432.9**
The year of barely density on vetch density	9	20.9^{ns}	51.5^{ns}	56.8^{ns}
error	27	63.5	302.7	116.9
CV (%)	-	9.2	10.4	11.5

ns, ** And * respectively denote non-significant and significant of one and five percent probability

Table 2: Analysis of mixed variance traits of row planting of barley-vetch in a factorial design based on the block

variation Sources	df	1000 grain weight	Barley biological function	Barely yield
Year (Y)	1	80.3^{ns}	1305.7**	887.5**
Replication	3	57.3 ^{ns}	880.4**	642.3**
Vetch density	3	33.8 ^{ns}	51.4 ^{ns}	98.3 ^{ns}
Year in The density of vetch	3	30.1 ^{ns}	44.8 ^{ns}	60.1 ^{ns}
Barely density	3	200.5**	499.2**	991.6**
Year in the density of barely	3	41.4 ^{ns}	535.2**	409.9*
Barley density in the density of vetch	9	175.6**	40.37 ^{ns}	535.7**
The year of barely density on vetch density	9	22.8 ^{ns}	20.9 ^{ns}	88.1 ^{ns}
Error	27	89.9	325.826	241.2
CV (%)	-	9.2	10.4	11.5

NS, ** and *denote significant and non-significant in one and five percent probability

Barley biological function

The comparison of the mean density interaction of the barely on vetch density in biological yield of barely in mixed additive intercropping showed that (Table 4-1). The highest biological yield is related to barely with the density of 500 plants and the zero density of vetch with the numeric value 17.315t ha and the lowest biological density was related to barely with the density of 300 plants and 650 plants density if with the numerical value of 8.796t ha. According to the results, the mean of biological interaction of barely in raw additive intercropping showed that, the highest biological function was related to barely density of 700plans in the second year with the number of 20.181t ha And the lowest biological function was related to barely density of 300 plants in the first year with a number value of 10.235t ha. Biological

yield increases with increasing plant density to a certain extent and some limitations such as food, the lack of space for growth and plant shading on each other, gradually decrease their performance [7].

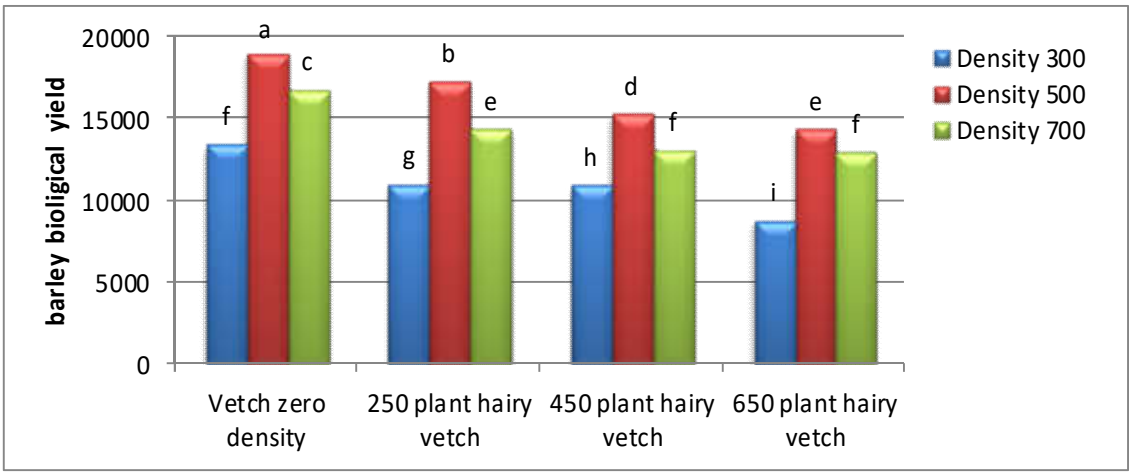

Figure 3. Comparing the density interaction of the barely on vetch density in biological function of barely in raw intercropping

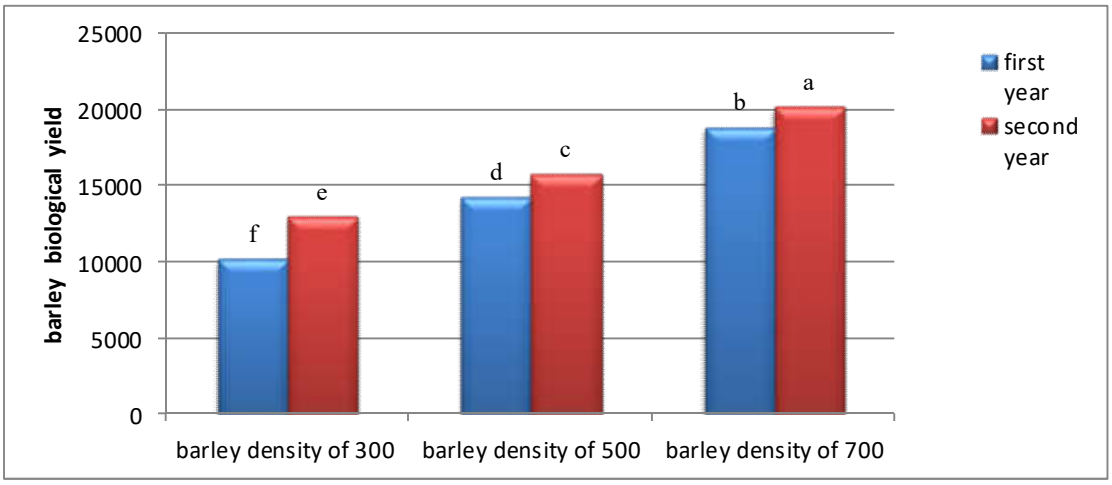

Figure 4: Comparison of the biological interaction of barely in raw additive intercropping

1000 Barley Weight

The analysis of variance showed a significant effect of 1000 barley weight in additive intercropping treatments (rows and mixed), (Table 4-1). According to (Table 4-2) the results showed that, the highest weight of 1000 barely was related to the treatments of the mixed additive intercropping Density and the results of barely density effect of 1000 grain weight in the treatments of mixed additive intercropping showed that, The highest weight of 1000 seed was in barely with the density of 300 plants with a weight of 35 grams And the lowest weight of 1000 seed was in the density of 700 plants of barley with a weight of 24 grams. The results of comparing the interaction of barely density on vetch density to 1000 seed weight in raw additive intercropping as the most important evaluation features showed that, the highest weight of 1000 seed was related to zero density of vetch and the barely density of 300 plants with a weight of 40 grams And the lowest 1000 seed weight was observed in vetch density of 650 plants and barely density of 700 with a weight of 29 g.

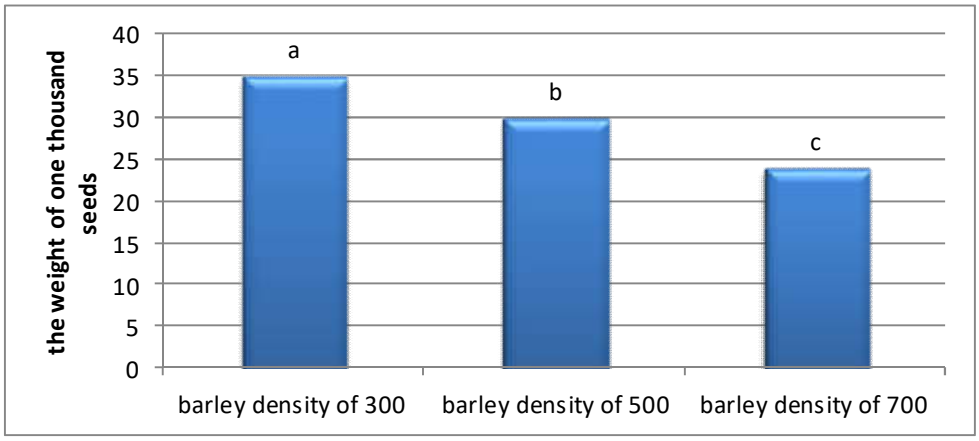

Figure 5. The Comparing the density effect of barely on weight of 1000 barely in mixed intercropping

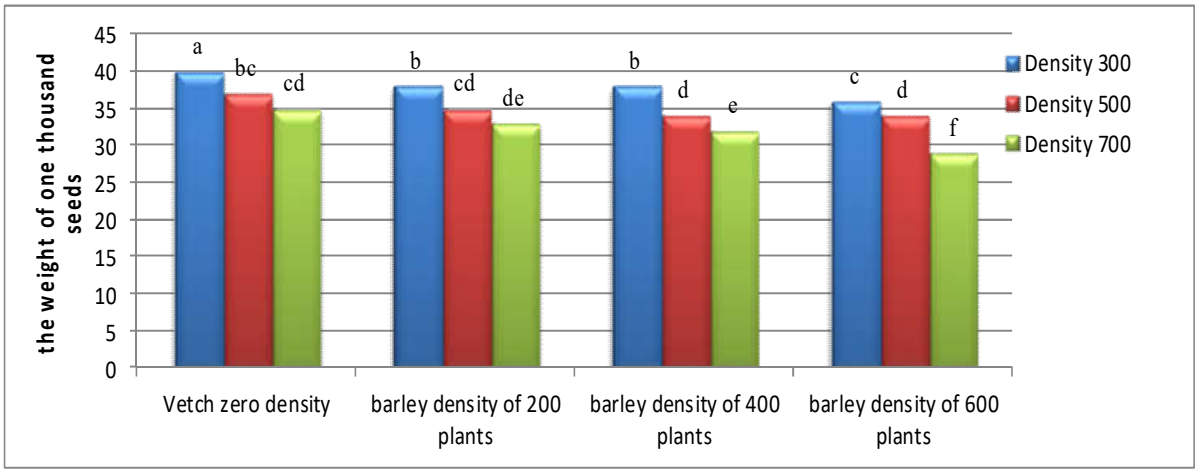

Figure 6. Comparison of density interaction of barely on vetch density on 1000 seed weight in raw intercropping

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