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Study the effect of Zinc spraying and plant density on seed yield And morphological characteristics of Green gram

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ABSTRACT

To investigate the effect on Zn spraying and plant density on seed yield and morphological characteristics of Green gram an experiment was conducted in summer 2011 in Koohdasht. Experiment was performed in split plot randomized complete block design with three replicates. Zn spraying was considered on three levels with no spraying, once spraying in a rapid growth phase, two times spraying with two in thousand concentration of Zn fertilizer. The results showed the superiority of the length of main stem s pod number, main stem node number, node number of lateral stem and seed yield was obtained in the method of spraying. Analysis of variance showed that the effect of plant density on seed yield, plant height, pod length in main stem and main stem node number was significant and the highest yield of 1787.5 kg/ha was related to the density of 33 plants per square meter and once spraying and this treatment is justified for the region.

Keywords: green gram, planting method, Zinc spraying, seed yield.

INTRODUCTION

Micronutrients are essential for plant growth, but in smaller amounts of NPK are used, these elements include iron, zinc, manganese, copper, molybdenum, chlorine [3]. Zinc (zn) is one of the seven pillars of nutrition and is needed for the growth of plant, animals and humans. The amount of Zn in pasture and forage is very little and varies from 20 to 30 mg/kg in soil[12]. Zn is necessary to activate many enzymes, enzymes that are activated by the Zn are tryptophan synthetase superoxide dismutase, and dehydrogenises. Stems and buds that have little of Zn contain a little of auxin it causes dwarf and decrease in growth, and lack of Zn causes deficiency of making RNA and protein. Therefore, the plant with lack of Zn is poor in amount of protein [19]. Cereals sprouts such as wheat, lentils and Green grams are rich in Zn is that its deficiency causes loss of appetite, vision problems and is slowly healing and anemia. Consumption of Green gram sprouts appropriate ways of providing of Zn. Anyway, foliar spraying of microelements for the growth of Green gram and its quality is Industry views is necessary for growth and quality of Green gram [6]. Renjel (2001) showed that Zn fertilizer application causes root and shoot growth during the growing season and therefore lead to increased seed yield. Spraying the leaves with the nutrient elements is one of the methods of plant supply. Although the leaves and shoots can absorb nutrients as well as food, gas through the stomata, but the absorption of nutrients as ions in solution is limited because foreign leaf epidermal cells covered with a layer. Hole et al, 2001 said that in leaf spraying method in addition to the rapid response, the fertilizer will also save money. The fertilization procedure in addition to economic aspects and the effectiveness of the immediate environment in order to achieve sustainable agriculture maintain that it is also very effective and useful [13]. With

increasing in soil fertility, water availability plant density increases as well. Increased in density more than desirable, in the way of competition, lodging, loss of lower leaves in low light and ... Although soil fertility and plant available water, is important factor in yield loss in high density [4].

Ehsan Ullah et al(2002)have done an experiment in Pakistan on the distance between rows and distance between plants under rows, the highest plant height was obtained from distance row 43cm and distance plant 7cm.

Ganjali et al (1998) studied the reaction of seed yield and morphological properties on Green gram varieties. The results suggest that although the yield per plant increasing with decrease in density, but this increase did not compensate for the lack of plants per unit area. The yield reaction to increasing density was positive and highest yield was obtained in rectangular shape and 70 plants per square meter. Arskyn and Khan (1984) reported that in high plant densities, increased seed yield of Green gram.

MATERIALS AND METHODS

This experiment was performed in the 2010 summer in the city of koohdasht-Lorestan with latitude 41° and 50' North and longitude 28° 35' East, with an average annual temperature16.8 and average annual rainfall of 159.8 mm .According to the division of geographical regions this region has subtropical climate with half hot summers and dry. The experiment was performed using to the split (split plot) design in the randomized complete block mold in three replications and 27 plots, in which the density in 3 levels (a1:10 cm, a2:7.5cm,a3:5 cm) as the main factor and were selected the Zinc spraying in a dose of two thousand at 3 levels (b1: zero, b2:once spraying, b2: three times spraying) as sub-factor. First, in order to awareness of the soil physico-chemical traits of the territory take a sample of composite and after the analyzing, the recommendations chemical fertilizers consumption based on the lab.

In order to planting in the last year a deep plowing was done and caused that previous crop residue went under the soil and were very rotten and more water is sorted in the earth, in the spring of next year we have a deep drive to break up the clog and weeds away and after the teeth and taking action to collect the weeds and after were planted. Each treatment or sub-plots consisted of six planting line of length with 5 meters and the distance between lines 40cm, 2 meters space between replications. In this research, we used Partov variety that it is standing growth, high resistance to loss, diseases and pests and it placed in groups of early cultivars. The harvest of four lines of the middle by omitting half a meter of each line side (to sake removing the margin effect). The experiments were performed in year 2010 during the summer growing period. Analyses were performed with a personal computer using the MSTATC software and for design the diagrams used the EXCEL software. In addition the Duncan's Multiple Range Test (DMRT) (P = 0.05) was used to conduct mean comparison of treatments and find significant differences among means.

Table1: Soil characteristics of the experimental site in Koohdasht, Iran where the experiment was conducted.

soli particle(%)			Lime	EC	K(ppm)	P(%)	C(%)
sand	silt	clay					
22	53	25	42.2	0.63	195	4.2	1.03
Texture			PH Ppm	Cu Ppm	Zn Ppm	Mn Ppm	Fe Ppm
silty loam			7.9	0.88	0.44	4.6	4

RESULTS AND DISCUSSION

Plant height

Plant density was significantly affected by plant density treatment (Table 2).

The cause of decrease in height was increased in distance of plant under row and more light into the canopy while at high density; increased plant height is the result of long stem cells and increase cell division. In the high density the number of secondary branch decreased and main stem was increase [16]. Analysis of variance showed that the spraying had significant effect on the height in 5% level. Mean Comparison showed that the highest average stem height of 40.6 cm was obtained in b2. Research shows that consumption of micronutrient iron and zinc foliar with increasing in stem height caused increased dry matter yield with the addition of dry matter [21].

The interaction between spraying and plant density on plant height was highly significant and maximum plant height (42.1cm)was obtained of two times the spraying and 33 plants per square meter (Figure 1).

Table 2: Factorial analysis of variance components (density, spaying and their interaction) for assessed traits.

S.O.V	df	Plant height	Length the pods on main stem	Pod length in secondary branch	Number of nodes on main stem	Stem diameter	Seed Yield
Replication	2	17.210^{ns}	55.368*	23.386^{ns}	0.123^{ns}	0.280^{ns}	177464.243^{ns}
Density(a)	2	355.125**	149.994**	21.499^{ns}	0.475^{ns}	0.052^{ns}	432046.556^{ns}
Error	4	14.178^{ns}	4.329^{ns}	7.485^{ns}	0.110^{ns}	0. 086^{ns}	75311.295^{ns}
Spraying(b)	2	27.507**	15.780^{ns}	63.727**	3.965**	0.010^{ns}	190424.869^{ns}
a*b	4	35.360**	40.401^{ns}	123.191**	2.345**	0.019^{ns}	278080.351*
Error	12	1.789	12.788	8.322	0.265	3.013	73790.073
CV		4/02	6.35	4.98	6.93	20.07	19.70

,significant at 5 and 1%,NS:not significant*

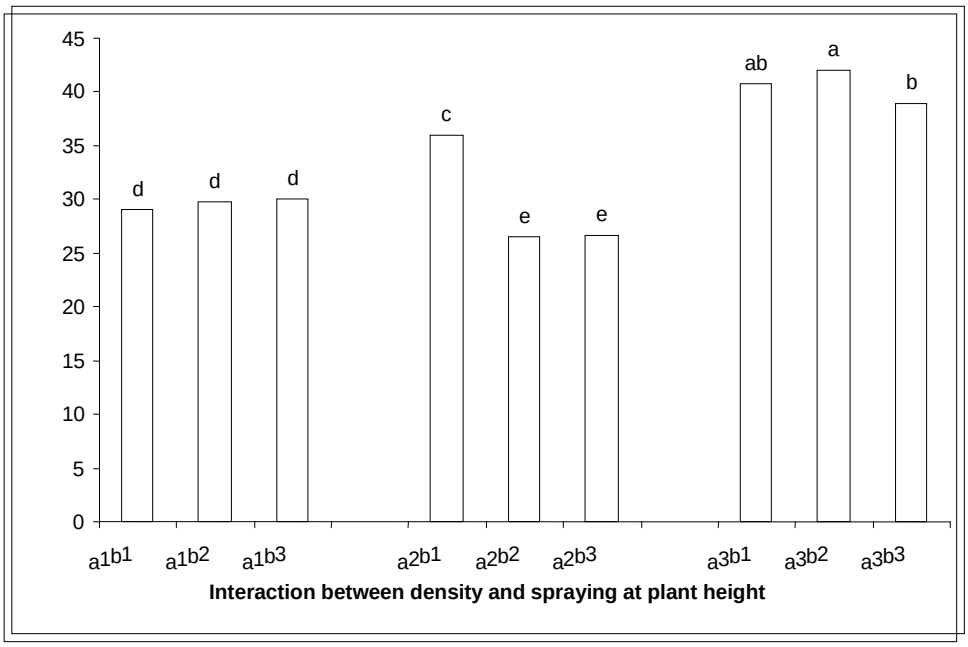

Figure 1 - The effects of spraying and plant density on plant height

Length the pods on main stem

According to the results of variance analysis the effect of plant density on the length the pods on main stem there was a statistically significant difference (Table 2). Mean comparison showed that the highest pod length in the main stem is related to the density of 33 plants per square meter with60.6mm length .This result are according to Yagoub zadeh et al results. Among Zn spraying treatments on length of pod in main stem of Green gram there was no significant difference but the maximum length of pod (57.3 mm) was obtained from the treatments were sprayed twice the results of Boswell et al (2003), Gupta and colleagues (2003) and Kasab (2005), Wade and colleagues (2002) is consistent. Foliar applications of micronutrients such as zinc have increased photosynthesis [3]. Plants that have benefited from the Zinc due to the most enzymatic activity in the photosynthetic reactions of green leaves during plant growth have had more time the pod length is increased.

Pod length in secondary branch

The results of variance analysis showed that there was no statistically significant difference between plant density and pod length in secondary branch on (Table 1). Mean comparison showed that the highest average pod length of secondary branches is related to the density of 33 plants per square meter during with 59.6 cm This result is consistent with the results of Yagob zadeh et al, 2006 (Fig. 2). Between Zn spraying treatments applied on the pod

length of secondary branch there was significant difference and maximum pod length (61 mm) were obtained from control. The results of Boswell et al (2003), Gupta and colleagues (2003) and Kasab (2005), Wade and colleagues (2002) has been inconsistent.

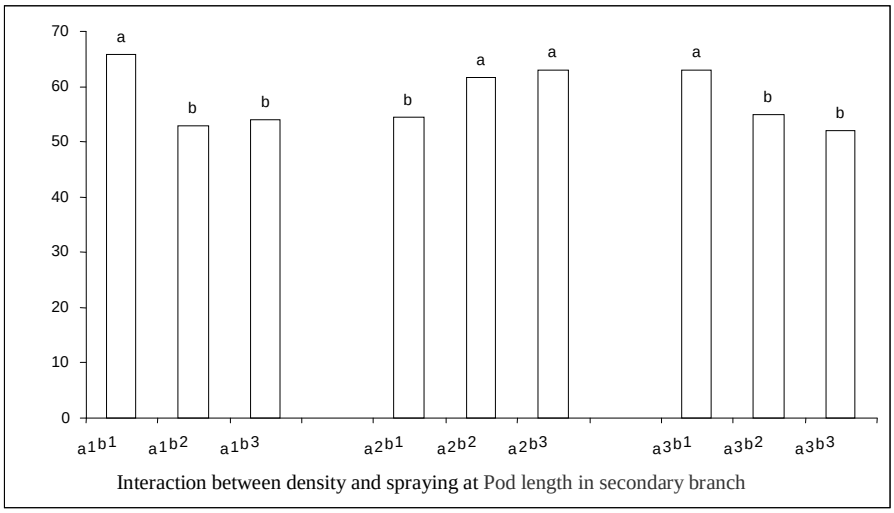

Figure 2 - The effects of Zn spraying and plant density on pod length of lateral branches

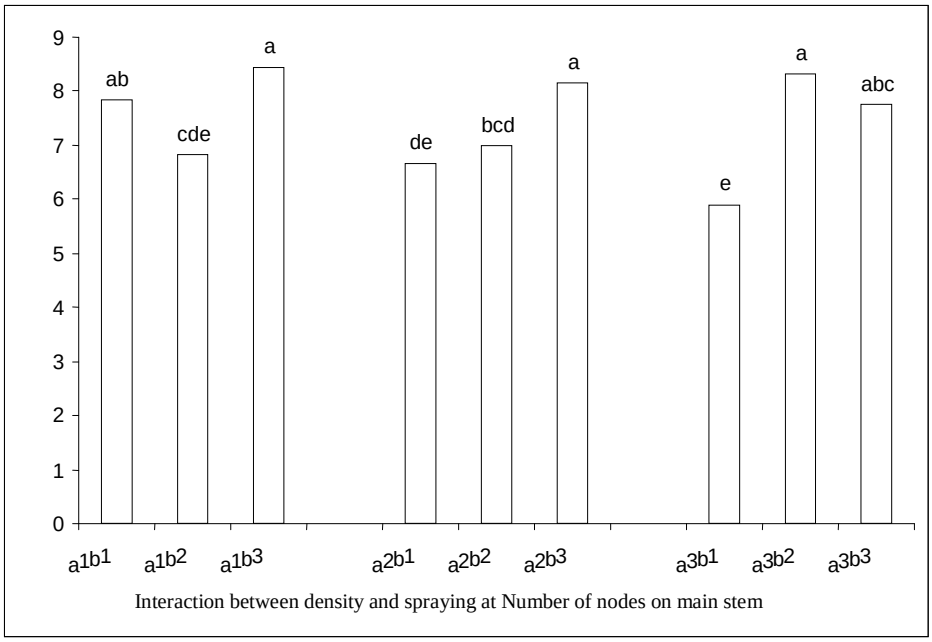

Figure 3 - The effects of Zn spraying and plant density on the number of nodes on main stem

Number of nodes on main stem

Number of nodes on main stem was not significantly influenced by experimental factors (table 1). But with increasing plant density reduced the number of nodes on main stem (Figure 3). In lower densities in spite of lower of the number of plants competition between plants and plant can uses the better of environmental conditions [15]. The main stem node number increased the results of analysis of variance showed that Zn spraying on the main stem has a

significant effect on the number of nodes. Mean comparison showed that the maximum number of nodes on main stem (8.1) related to two times of Zn spraying the results of Taloot et al (2006), Boswell et al (2003), Gupta and colleagues (2003) and Kasab (2005) is consistent. The effects of zinc on the metabolism and biological activity, stimulating the enzyme activity of photosynthetic pigments and vegetative growth of plants was increased thus caused to increasing the number of nodes on main stem[14].

Stem diameter

Stem diameter were not affected by plant density treatments (Table 1). But in the density of 25 plants per square meter stem diameter was greater than other densities. Caused of reduction in stem diameter was due to the reduction of the plants distance on lines, less light penetration into the canopy and create competition between plants for nutrient uptake.

While at low densities, increasing the stem diameter is the result of stem cells constructive and increase cell division and less competition for nutrients and moisture is absorbed [16]. Analysis of variance carried out showed that Zn spraying had no significant effect on stem diameter. Mean comparison showed that the highest stem diameter with an average of 0.61cmis related to once Zn spraying treatment. Research shows that zinc and iron spraying with the addition in the stem diameter and plant growth will be increased in the dry matter in green gram [21]. Interaction of Zn spraying treatments and plant density on the stem diameter was not significant.

Seed Yield

The results of variance analysis showed that the effect of plant density on seed yield had not statistically significant differences (table 1). Mean comparison showed that the highest seed yield was obtained from density 33.3 plants per square meter with the production of 1611.1 kg/ha. Other researchers, including Singh et al (1998) stated that yield would be affected by plant density. Between Zn spraying treatments applied on the seed yield there were significantly different, maximum yield of Green gram was 1529.8 kg / ha was obtained from once Zn spraying.Interaction effects of Zn spraying, and plant density on seed yield was very meaningful (figure 4). And maximum yield (1787.5 kg/ ha) was obtained from 33 plants per square meter and once Zn spraying treatment were applied This was probably that Zn spraying caused increased dry matter and will result in increased seed yield.

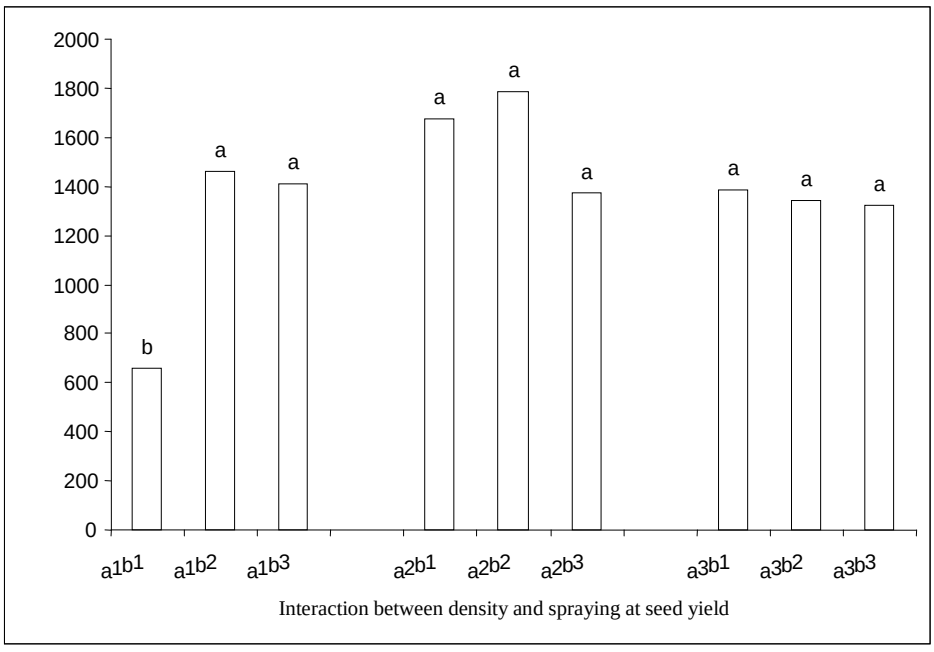

Figure 3 - The effects of Zn spraying and plant density on the seed yield

CONCLUSION

According to the results of variance analysis, the effect of plant density on seed yield there was statistically significant differences. Mean comparison showed that the highest yield of density was obtained from 33.3 plants per square meter there was significant deferent between Zn spraying treatments on the seed yield and interaction between Zn spraying and plant density on the seed yield was very significant. In addition, the best density for this research was 33 plants per square meter.

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