J. Basic. Appl. Sci. Res., 2(9)8653-3658, 2012

ISSN 2090-4304
Journal of Basic and Applied Scientific Research
www.textroad.com

Study of Snow Flake Cultivation and Customizability in Guilan

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ABSTRACT

The Snow flake with the scientific name Leucojum is a bulbous plant and belongs to Amaryllidaceae family. There are only two species currently classified in the genus Leucojum: Spring snow flake (Leucojum vernum) and Summer snow flake (Leucojum aestivum). The genous that is growing in Iran is Summer snow flake (Leucojum aestivum). In Iran it has been seen in Guilan, Mazandaran and Azarbaijan. In Guilan it naturally grows in Astane and Lahijan. This plant has ornamental uses in Europe and America, hence this research aims are localizing this plant and investigating the proposed beds for using in pots and landscape. This experiment was done in split-plot and calculated in a randomized complete block design. The onions were collected in the winter of 2010, from the Niyakoo village of Astane, 5 Km before Lahijan and transferred to the experiment place, the farm of department agriculture of Islamic Azad University of Rasht. The planting media tested include: 1.The main habitat soil of plant 2. the composition of mould leaf + rice husk, 3. Loamy soil + thoroughly rotten manure + rice husk, 4. Loamy soil + thoroughly rotten manure + rice husk + mould leaf. The onions were selected in single and multiple (as in their original habitat) and were placed in two light postions: 1. The low light, under the jute (the same lighting condition as its main habitat), 2. The outdoor light. The result of variance analysis showed that the light conditions were significant in the levels of 5 and 1 percent for the different characteristics including leaf length, flowering stem length and the number of flowering stem. In addition, the result showed that the interaction of ligh conditions and media on the vegetative growth and flower stem were significant in the levels of 5 and 1 percent. The comparison of averages proved that low light conditions, was more effective for the vegetative growth than the outdoors light. This is done while the environmental light had better results in the reproductive phase. According to the obtained results, it can be announced that all proposed media were effective for the snow flake growth, but the treatment of mould leaf with rice husk was the best one, especially for the multiple bulbs. Ultimately, the snow flake can be introduced as a localizable plant, that can be planted in single and multiple onions, in different light conditions, in landscapes.
KEY WORDS: Snow flake, localization, Guilan.

INTRODUCTION

There are different varieties of bulbous plants native to Iran such as tulip, hyacinth, Fritillaria imperialis, lilium lederbourii, Colchicum autumnale, Muscari armeniacum and the like. Guilan province due to its various climates from plain tomountain is a native land to a large number of species some of which have high ornamental potential. For instance snowflake grows well in Guilan. It is a bulbous plant of Leucojum genus and belongs to Armaryllidaceae family.Unlike most bulbous plants it is the tolerant of high moisture and pathogenic fungi. It grows well in low land, wetland and waterlogged areas of North of Iran. It has also been observed in Mazanderan and Azarbayejan. In Guilan Snowflake grows naturally in Astaneh and Lahijan. In these regions, it grows in wetland, in the shade of trees, at the bank of rivers and around lagoons (Fig.1).

Fig. 1: The Plat habitat in Niyako-between Lahijan and Astaneh, Iran.

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It has also been seen in Europe, North and South of Asia (Webb, 1980). Spring Snowflake (Leucojum vernum) and Summer Snowflake or Loddon Lily (Leucojum aestivum), are the only species currently classified in the genus Leucojum (Jovanović et al., 2004). Guilan Snowflake species is L. aestivum. Its stems are as tall as its leaves and flowers. The leaves are 4 up to 6 cm wide, have two and are thicker on the edges. Its flowers are white, one-way and appear in 3 up to 7 bunches. Petals are longer than spot (Burnie, 2000). Leucojum vernum flowers from February to April. With regard to its beauty, long life of its petals, its tolerance to unfavourable conditions and its growth in wetlands, it can be easily used in landscapes as flowerpots and for other purposes. In America and Europe, it has many ornamental usages. Accordingly, the present research intends to identify it fully, to naturalize and to investigate its ornamental potentials.

MATERIALS AND METHODS

Naturalization experiments has been conducted at the Faculty of Agriculture of Islamic Azad University of Rasht Campus located at latitude of 16°37' , longitude of 49° 35' E and at altitude of 6 m above sea level from Jan. 2010 to Jun. 2011. Its bulbs have been collected from its natural habitat in Niako located at latitude of 49°51-57' N , longitude of 37° 11=14' E , at altitude of 5 m above sea level and 5 km to Lahijan . The bulbs have been dug out with some soil around them when the first leaf had appeared. To do the experiments common and cheap beds with various compounds have been employed. Beds have been: b1- soil from habitat, b2- leaf mould + rice husk (3:1), b3- mixture of loam + rotten animal manure+ rice husk (1:2:1), b4- loam + rotten animal manure + rice husk + leaf mould (1:1:1:1). Bulbs have been planted in pots individually and in cluster in 64 pots (32 pots with single bulb and 32 with several bulbs) and have been place in open air. The next treatment has been the application of light with different conditions: A1- The low light by putting the pots under the jute, in order to have an environment like its habitat, A2- Normal light and without shelter. The purpose of using different light conditions was to demonstrate they can grow in shade under the leaves and branches of trees without any etiolation. The measured characteristics have been leaf length, flowering stem length, flower diameter, apical diameter, number of flowers and number of flowering stems. Leaf length has been measured by rulers evert 4 or 8 day once, from 19th day after planting and diameter by digital caliper. The soil of its habitat has been sampled and tested as well (Table 1)

Table 1. The soil test results of snowflake original habitat

PH	EC(ds/m)	Organic Carbon	Total nitrogen	Lime	Absorbable potassium (mg.kg)	Absorbable phosphate (mg.kg)	Sand	Clay	Cilice
8.6	01.1	6.4	39.0	5/3	4/177	5.6	66	10	24

Soil Texture of the region was sandy loam and has inorganic materials up to 4%. The experiments have been carried out in spilt plot based on the fully random block design by two factors of planting bed and light in 4 replicates.

RESULTS AND DISCUSSION

Variance analysis of the effect of light conditions on the vegetative growth of cluster bulbs has been significant at the levels of 1 and 5 %. The media factor has also shown a significant effect from day 58th after planting till the end of the experiments at the levels of 1 and 5 %. The comparison of the average effect of light conditions on the vegetative growth (leaf length) has also proved that dim light is better and more effective than the outdoors light (Table 2 and Figure 2).

Table 2. The comparison of the average effect of light conditions on the developmental growth (leaf length)

	Day after planting								
Light conditions	62	70	74	78	82	85	89	94	105
A_1(light)	40.06b	43.71b	44.03b	46.31b	47.4b	47.6b	48b	48.93b	50.48b
A_2(Darkness)	45.04a	52.9a	54.34a	55.31a	56.31a	56.6a	57.18a	57.84a	60.28a

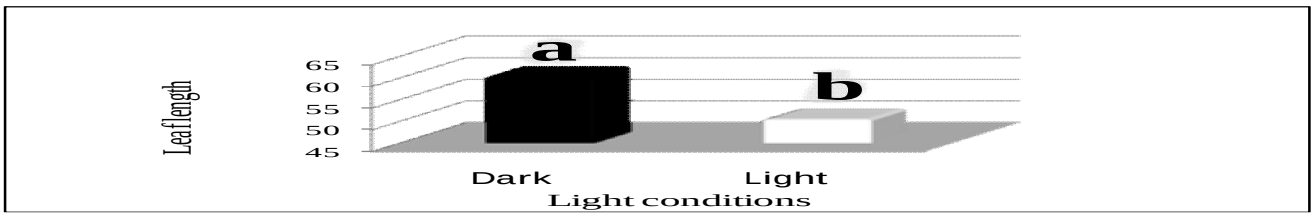

Figure 2. The comparison of the average effect of light conditions on the vegetative growth (leaf growth) of snowflake with cluster bulbs.

The comparison of media effect on vegetative growth (leaf length) has also indicated that the best one has been leaf mould + rice husk (Figure 3).

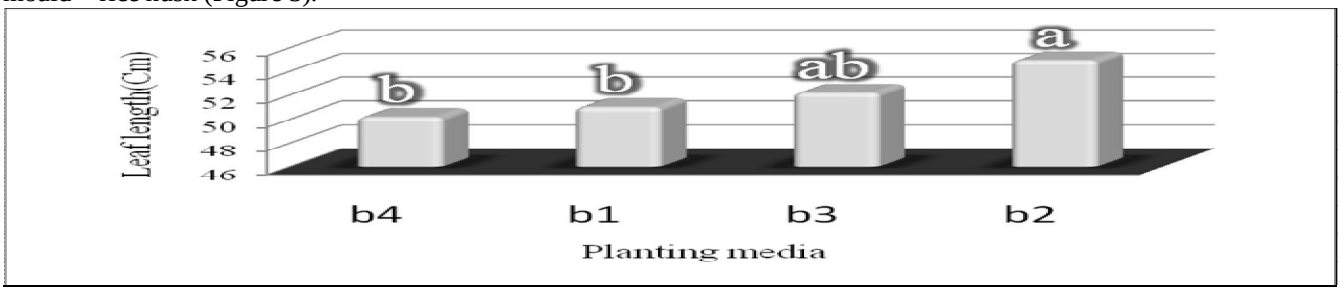

Figure 3. The comparison of the media effect on the developmental growth (leaf length) of snowflake with cluster bulbs

Variance analysis of the effect of experimental factors on the vegetative growth of cluster bulbs has shown that the effect of light condition (factor A) on the number of flower and its diameter has been significant at the level of 1% and collective effect of media and light conditions on the number of flowering stem has been significant at the levels of 5 % as well (Table 3).

Table 3. The results of variance analysis of the effect of experimental factors on the generative growth of cluster bulbs

	Squers average						
Sources of changes	Degree of freedom	No. of flower	No. Of flowering stem	Flower diameter	Crown diameter	diameter Of flowering stem	Height of flowering stem
Replicate	3	41.12	7.11	423.06	1.83	9.19	1751.86
Factor A	1	120.12^{***}	1.53^{ns}	807.11^{**}	3.89^{ns}	8.38^{ns}	756.11^{ns}
First Error	3	10.79	0.11	5.14	1.55	0.49	39.40
Factor A(media)	3	1.54^{ns}	0.44^{ns}	55.62^{ns}	0.40^{ns}	1.35^{ns}	1014.27^{ns}
Collective effect of AB(media.light)	3	14.54^{ns}	4.28^{*}	89.43^{ns}	0.93^{ns}	4.61^{ns}	701.70^{ns}
Total Error	18	7.65	1.28	88	1.72	3.53	368.60
C.V	-	94.17	88.34	86.43	14.94	77.84	65.46

^{ns}: Non-significant, *: significant at the level of 5 %, **: significant at the level of 1 %

The comparison of the average effect of outdoors light on the development of outdoors light is more effective than the darkness (Figure 4). Furthermore the effect of light on flower diameter of cluster bulbs has been more than the darkness (Figure 5).

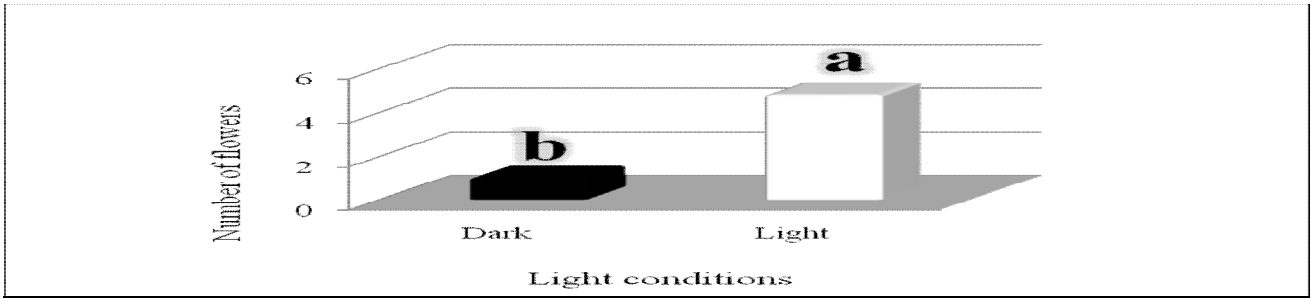

Figure 4. The comparison of the average effect of light condition on the development of generative traits - number of flowers -of cluster bulbs

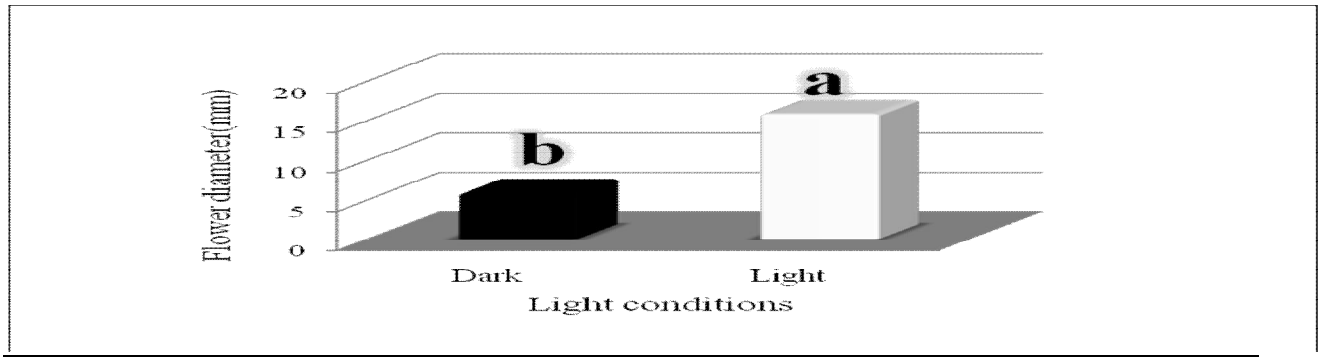

Figure 5. The comparison of the average effect of light condition on flower diameter of cluster bulbs

The comparison of the average effect of light condition and media on the development of generative traits, number of flowers has indicated that normal light and leaf mould + rice husk are the best (Figure 6).

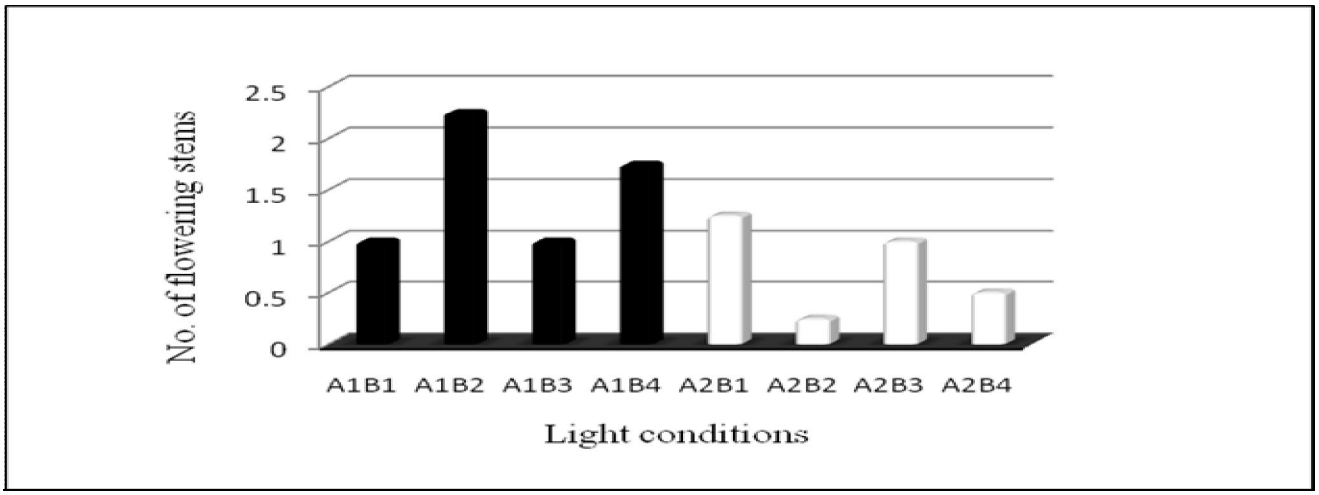

Figure 6. The effect of light condition on number of flowering stem

Variance analysis of the effect of experimental factors on the developmental growth of the plant with single bulb has indicated that the effect of light condition has been significant at the levels of 1 and 5 % after day 58th and collective effect of light condition and bed from day 49th up to day 74th (Table 4).

Table.4. Variance analysis of the effect of experimental factors on the developmental growth of the plant with single bulb.Day after planting

Sources of changes	Degree of freedom	19	23	31	35	39	42	46	49	54	58	62	70	74	78	82	85	89	94	105
Replicae	3	2.45	1.69	9.15	6.21	8.36	11.81	12.29	15.89	13.77	24.65	3.9	25.31	7.27	18.8	21.21	18.75	17.86	14.59	16.54
Factor A	1	50.50^{ns}	53.82^{ns}	29.07^{ns}	35.07^{ns}	21.94^{ns}	11.28^{ns}	37.19^{ns}	57.78^{ns}	110.6^{ns}	233.8*	61.1**	810**	45.9**	586.5**	552.1**	532.1*	548.6*	599.4*	639*
First Error	3	14.32	21.25	20.86	24.38	21.36	22.38	22.25	15.67	20.84	11.48	9.15	12.80	14.15	14.63	14.13	23.15	31.94	39.82	35.78
Factor B	3	3.46^{ns}	7.96^{ns}	13.32^{ns}	15.44^{ns}	14.40^{ns}	20.93^{ns}	13.79^{ns}	17.27^{ns}	19.75^{ns}	13.46^{ns}	.65^{ns}	8.64^{ns}	3.75^{ns}	15.94^{ns}	19.67^{ns}	12.48^{ns}	15.46^{ns}	14.07^{ns}	11.18^{ns}
collective effect of AB	3	20.76^{ns}	20.61^{ns}	28.36^{ns}	28.90^{ns}	77.33^{ns}	30.67^{ns}	34.59^{ns}	38.67*	39.77*	41.54*	46.23*	68.01*	60.46*	60.11^{ns}	63.55^{ns}	58.96^{ns}	51.50^{ns}	53.25^{ns}	45.80^{ns}
Total Error	18	12.47	13.95	12.36	12.57	13.57	14.65	11.16	11.06	13.37	12.34	11.48	15.08	17.23	20.80	22.05	22.69	22.49	23.06	18.21
Changes index	-	24.53	22.15	16.48	15.38	15.08	14.79	11.84	10.64	10.70	9.54	8.57	8.50	8.82	9.34	9.38	9.41	9.22	9.12	7.76

^{ns}: Non-significant, *: significant at the level of 5 % and **: significant at the level of 1 %

The comparison of the average effect of light on the developmental growth of the plant with single bulb has also indicated that the dim light (under jute curtain) is more effective than darkness (Table 5).

Table. 5 The comparison of the average effect of light on the leaf length of the plant with single bulb

Day after planting											
light conditions											
A_1(light)	34.09b	36.15b	40.65b	42.21b	44.5b	45.87b	46.53b	47.25	48.28	50.46b
A_2(dark)	39.5a	42.87a	50.71a	51.87a	53.06a	54.18a	54.68a	55.53a	56.93a	59.40a

Moreover the comparison of the collective effect of light and bed on the developmental growth of the plant with single bulb has also indicated that the best condition is A2 B1, bed of the first type (soil of its habitat), the dim light (under the jute) or the light similar to that of its habitat (Figure 7).

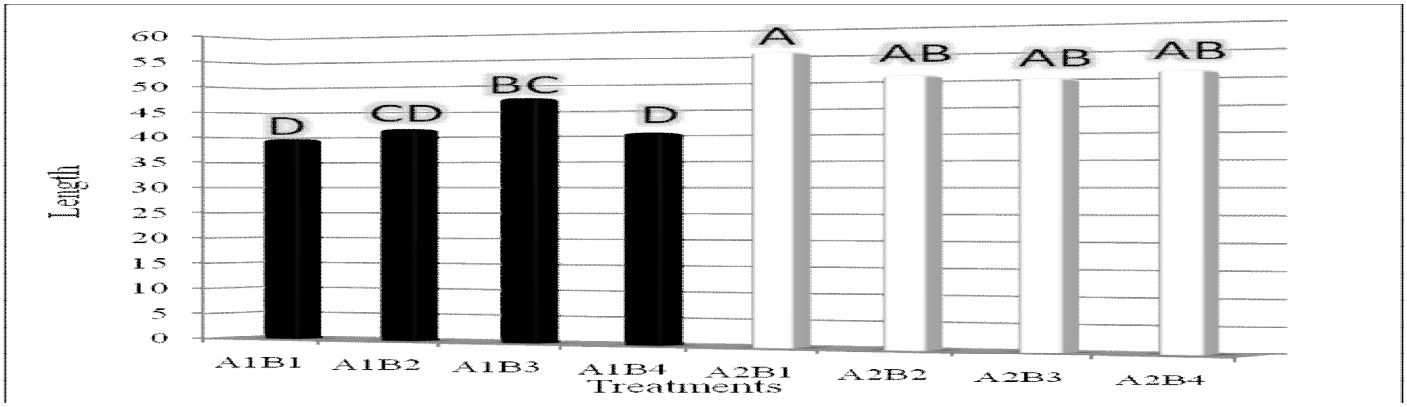

Figure 7: The collective effect of light and media on leaf length

Conclusion

Jalili and Jamzad (2000) and Rechiner (1990) stated that Iran with 8000 plant species is one of the major center of native plant species in the world. Shibu et al (2006), reported that organic materials improve physical and chemical properties of soil and enrich its nutrients. Today a great deal of researches is done on cheap media. Recently rice husk has attracted a great deal of attention due to its cheapness. Chanseetis et al (2001) found that to produce lettuce rice husk in spring and summer has the best performance compared to coconut fibers.

Gul (1999) studied the effect of ten different beds including rice husk, perlite, peat and their combinatory beds on tomato performance and found that rice husk leads to lower stem height in comparison to other beds. Langdon et al (2008) stated that with density increase Gladious plants compete for light which results in height increase. Dehertogh and LeNard (1993) reported that environmental factors like light, temperature, wetness affect on growth of pulpy plants. It might be due to the availability of photosynthetic materials to growing cormlet which competes with growing inflorescence.

Hocking (1993), reported that environmental conditions and the number of the required days affect on the flowering of Gladious. Rameau and Gouyon (1991), Shillo and Halevy and Wassinka (1965) has also found the same result. San-oh et al (2006) also stated that reduction of light intensity beside photosynthesis reduction can result in shading, and lowering temperature around bulbs which in turn lead to lower performance and reduction of bulb size.

General speaking by studying on snowflake planting and assessing its adaptability in guilan conditions and measuring the ornamental factors like growth span, inflorescence diameter, height of flowering stem, number of flowers and the plant height it has been found that the best bed for planting plants with cluster bulbs is the combination of leaf mould and rice husk and the best one for single bulb plants is the soil of its habitat due to its adaptability and its lower need to nutrients. In conclusion planting snowflakes under normal light in spaces like parks, Boulevards and the like is recommended and the light condition can be like that of North of Iran, cold and mountainous areas or that of Tehran.

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