

Ecological Capacity of Lotus in Adaptation with Environmental Conditions

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Abstract. Sundry species have different capability on adaptation with environmental conditions such as; climate changes. Lotus has high longevity and is native of North Africa and Middle East and able to growing in dessert climate that has only 100 mm precipitation. However, suitable area for this species is valleys that have accessible ground water. Lotus grow in semi-arid area specially alluvium plain with profound soil and might be create open forest at steppes. Its main roots (vertical roots) have high growing, stem have high shooting, have high tolerate to dry and temperature and create slight forest. Seeds have two embryos that will be result in two shoots, often. Lotus is suitable for soil erosion control in arid area because of high tolerate to dry and waterless, also have various advantage for animal feeding, wildlife, soil protection and articles of medicine. In plantation by Lotus would be careful that warm wind and Phozarium fungus (phozarium sp.) could be disappear the shoots. Maximum generation of seeds after 18 days from planting (soaked in water during 2 days) is 94% and minimum generation of seeds (68%) happen on 66 days from plantation (soaked in water during 3 days). Precipitation regime of Lotus in south of Iran is semi-Mediterranean. Average annual rainfall is 100-580 mm, minimum of monthly temperature is 3-10 and its maximum is 38-45°C, minimum, and maximum temperature record of -8 and 55 °C, 55-65% annual relative humidity and 2700-3000mm evaporation. Lotus has grown and distribution in area with various soil textures such as; loamy, sandy- loamy, silty- loamy, silty-clay and 0.18-3.9 mmohs/cm salinity, 7-8.2 pH and 23-60% saturation. Ordination of plant ecological groups showed that Lotus has high correlation with both soil humidity and C/N in second layer. Then each soil that able to maintain the humid on inferior layer and contain low ratio of C/N will be suitable for Lotus. Natural sites of Lotus is include species of annual alfalfa (Lucerne), this annual species are very important for improvement and enrichment of rangelands. Lotus is evergreen and has two flowering in year. Results of plantation without irrigation in an area with hot summer showed the acceptable germination (50%). Lotus and its attendant species create a plant ecological group, this group have high rang tolerance to altitude changes and because of temperature and humid changes are subject to altitude changes, this group (and its species specially Lotus) have high rang tolerance to temperature, humid and altitude changes.

Keywords: Lotus, climate changes, temperature, humid, plant ecological group.

1. Introduction

Ecosystem is including living beings and lifeless environment. Plants are one part of ecosystem and have an important role in the life of other beings as a primary producer (Asri, 1994). Vegetation in its ecological content has three important aspects. First, in large parts of dryness surface, except very hot or cold deserts, vegetation content is the most obvious physical sector of an ecosystem and when an ecologist talked of different kinds of ecosystem, usually then note to plant types. Secondly, vegetation is the primary production which is achieved through the power of sun during photosynthesis with the use of different plants it changed to green tissue of a plant.

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The primary pure production which is a cumulative of green plant tissue in a specific area and in a specific vegetation types within a certain period of time, makes the base of food pyramid, all other organisms in the upper chain of pyramid ultimately very on green plants.

Third, vegetation acts as a habitat of organism living within it, growth and reproduction and eventually dies (Turesson, 1952). Regards to these three important aspects, the importance of cover plants in ecology is clear and the need to use methods that helps vegetation description and analysis will reveal.

In plant communities, species under specific ecological condition will grow, proliferate and survive. So the presence of species in a habitat means its need to temperature, Light, Food and availability of water and humidity. Phytosociology- that recognizes and describes the plants, plant groups and communities- showed that is a high correlation between plants and environmental condition (Zahedi, 1998), also sundry species have different capability on adaptation with environmental conditions.

2. Materials and Methods

Physiology, phenology and phytosociology of Lotus stand and their relation and adaptation range with environmental conditions were studied in two times: growing season and dry season (summer).

Plant ecological groups were determined based on vegetation data analysis (TWINSPAN) and ordination analysis (DCA) methods. Geographic information system (GIS) used for mapping plant ecological groups and digital elevation model (DEM). For planning soil sampling used from Sorenson index between plots, and its less than 75%, selected the plot as a place for soil sample. Then, select 63 plots for soil sampling.

For general investigation of soil characteristics such as color, size of horizons, roots, etc, select 20 profiles. This investigation showed that the soil of study area include two horizons (0-7_{cm} & 7-25_{cm}). Soil sampling carried out from both horizons (organic and mineral). Soil characteristics including Texture, Lime, Moisture and pH, EC, N, P, C and KOH investigated and used for analyzing by PCA method.

3. Results and conclusions

Sundry species have different capability on adaptation with environmental conditions such as climate changes. Lotus has high longevity and is native of North Africa and Middle East and able to growing in desert climate that has only 100 mm precipitation. However, suitable area for this species is valleys that have accessible ground water. Lotus grow in semi-arid area specially alluvium plain with profound soil and might be create open forest at steppes. Its main roots (vertical roots) have high growing, stem have high shooting, have high tolerate to dry and temperature and create slight forest. Seeds have two embryos that will be result in two shoots, often and Flower of Lotus (especially in summer) is useful source for bee. Powder and extract that take from leaf of Lotus is very suitable for use as shampoo. Roots of Lotus sapling are sensitive and might be damage in transfer from nursery to site area.

Lotus is evergreen and has two flowering in year. Results of plantation without irrigation in an area with hot summer showed the acceptable germination (50%). Therefore, plantation with water stores (rain, fog & dew) has high success. Maximum germination of seeds after 18 days from planting (soaked in water during 2 days) is 94% and minimum germination of seeds (68%) happen on 66 days from plantation (soaked in water during 3 days).

Precipitation regime of Lotus in south of Iran is semi-Mediterranean. Average annual rainfall is 100-580 mm, minimum of monthly temperature is 3-10 and its maximum is 38-45°C, minimum, and maximum temperature record of -8 and 55 °C, 55-65% annual relative humidity and 2700-3000mm evaporation. Lotus has grown and distribution in area with various soil textures such as; loamy, sandy- loamy, silty- loamy, silty-clay and 0.18-3.9 mmohs/cm salinity, 7-8.2 pH and 23-60% saturation.

Effective factors on Lotus sites degradation are including:

Human factors: cutting the branches, over grazing of domestic animal, gathering the seeds on high - level, utilization in order to shampoo supply, mines extraction, development of dry farming and intention fire.

Natural factors: pests, natural fire and long drought.

Physiological study recognize the amount of biomass on leaf and branches (91.4 to 91.8 %), energy (3492 to 4476 cal/gr), raw protein (13 to 15), useable protein (9.5), calcium (1.6 to 2.1) and phosphor (0.08 to 0.11). these results show that the leaf and branches of this species is suitable for animal feeding. Investigation of soil recognizes the physical and chemical characteristics (showed in table 1).

Table 1: Physical and chemical characteristics of soil

Factor	Layer A	Layer B
Humid %	52.05	59.75
pH	7.2	7.2
C %	2.15	1.67
CaCO ₃ %	21.85	24.69
N %	0.272	0.117
P p.p.m	15.88	15.88
KOH p.p.m	306	195
EC	0.58	1.02
Lay %	33.92	54.12
Clay %	12.66	33.36
Sand %	53.52	12.52
C/N	8.52	14.86

Elevation: up to 900 m, Slope: up to 35 %

Attendant species with Lotus are including *Prosopis specigera*, *Lycium shawii*, *Amygdalus scoparia*, *Amygdalus lycioides*, *Alhagi camelorus*, *Stipa capensis*, *Rhamnus cathartica*, *Veronicaacrotheca*, *Capparis cartilaginea*, and *Salsula drummondii*.

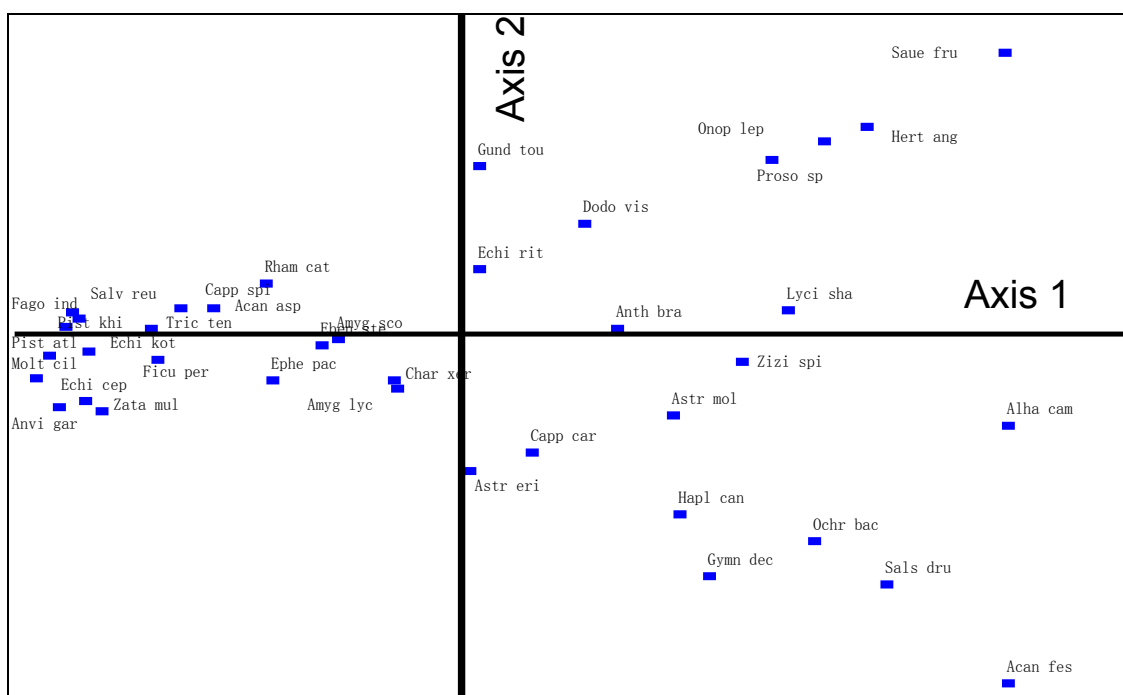


Fig. 1: Place position of plant species in relation with together.

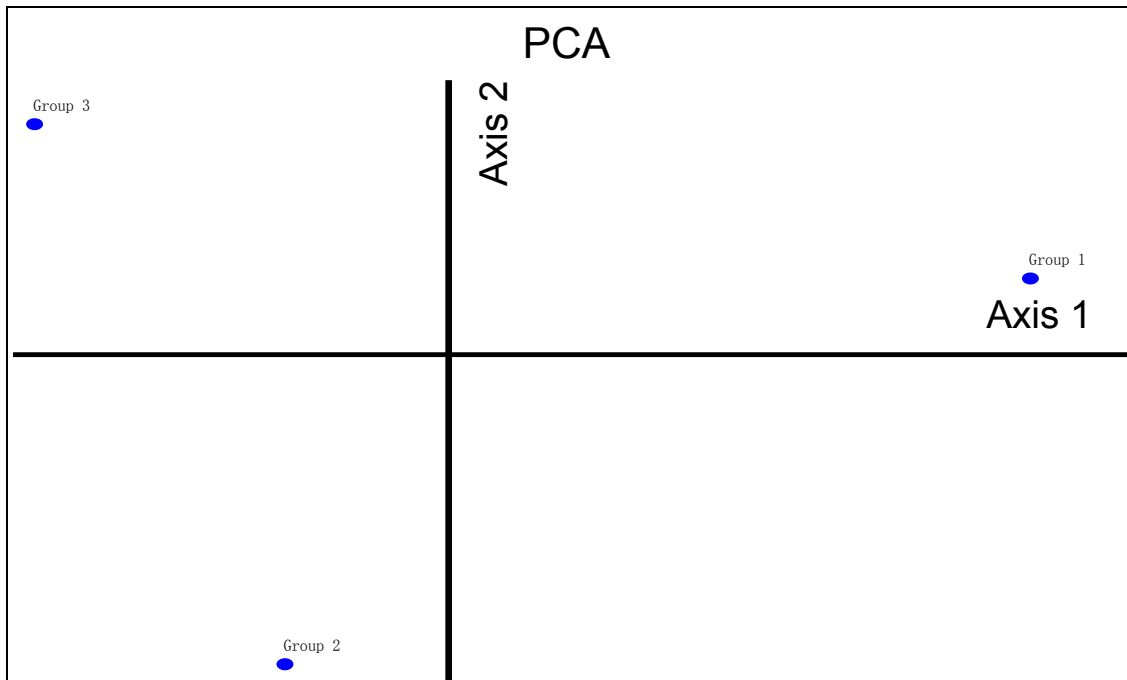


Fig. 2: Position of plant ecological groups concerning soil properties and physiographic factors.

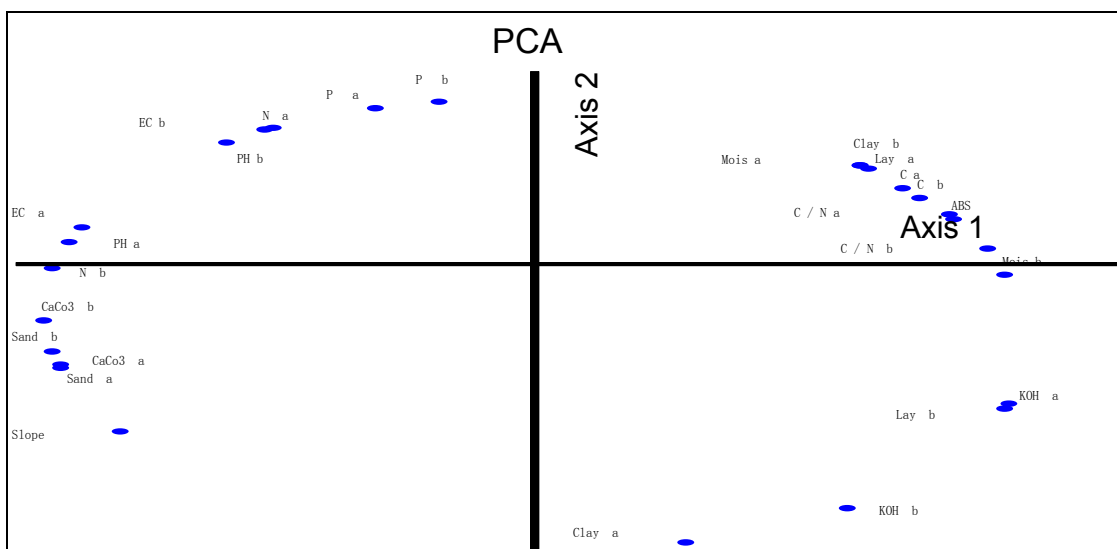


Fig. 3: Position of soil properties and physiographic factors in plant ecological groups.

Lotus is suitable for soil erosion control in arid area because of high tolerance to dry and waterless, also has various advantages for animal feeding, wildlife, soil protection and medicinal purposes. In plantation by Lotus, it is important to be careful that warm wind and Phozarium fungus (*phozarium sp.*) could disappear the shoots.

Ordination of plant ecological groups showed that Lotus has high correlation with both soil humidity and C/N in the second layer. Then each soil that is able to maintain the humidity on the inferior layer and contains a low ratio of C/N will be suitable for Lotus (Fig. 1, 2 and 3). The results regarding the soil humidity and C/N effect seem consistent with those of Ahmadi (1986), Cole et al (1982), Fu et al (2004) and Klotzli et al (2001).

Natural sites of Lotus include species of annual alfalfa (Lucerne), these annual species are very important for improvement and enrichment of rangelands.

Lotus and its attendant species create a plant ecological group, this group has high range tolerance to altitude changes and because of temperature and humidity changes are subject to altitude changes, this group (and its species specially Lotus) has high range tolerance to temperature, humidity and altitude changes.

Natural and heap regeneration on Lotus stand showed that if the seeds remain on site area and water and humidity be enough, regeneration will be considerable. Lotus has edible fruits for people (as dessert) and animal feeding and because of hard crust of seed, these evacuated seeds will germinate after winter. The results are also consistent with the studies of Whittaker (1962 and 1969) and Daper et al (1998).

4. References

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