# Globe locust (Robinia pseudoacacia var. umbraculifera D.C.): a potential forage species?

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# Globe locust (*Robinia pseudoacacia* var. *umbraculifera* D.C.): a potential forage species?

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**Summary** - Globe locust (*Robinia pseudoacacia* var. *umbraculifera* D.C.), a small leguminous tree, is one of the several botanical varieties of black locust (*Robinia pseudoacacia* L.). It has a dense, globe-shaped crown, and it is often used - grafted on a black locust rootstock – for ornamental purposes. It is thornless and rarely flowers. In an experiment conducted in the farm of the Forest Research Institute, 20 km NE of Thessaloniki, in Greece, this variety was studied in terms of forage production and quality along with clones and half-sib families of the black locust variety *monophylla* and common black locust as a control. More specifically, ramets of globe locust produced by rooted stem cuttings were tested for three consecutive years (1994-96) and at the end of each growing period the height, the above ground biomass and crude protein (CP) content of leaves were measured. It was found that the above ground biomass of this variety was significantly increased in the third year since establishment (by 256%) but it was much lower than that of *monophylla* and common black locust, but the ratio leaves/branches was more favorable. Its CP content (174g/kg DM basis) did not differ from the *monophylla* clones while surpassed common black locust by 18%. In addition, this variety appeared to have a remarkable rooting ability, much higher than the others. It is concluded that globe locust, apart of its use for decorative purposes, could be used for the production of high nutritive value forage for livestock, specially if grafted on common black locust root stock.

**Key-words**: Globe locust, height, biomass, forage value, Mediterranean environment

***Résumé*** - Robinia umbraculifera *est une variété du robinier présentant une couronne dense et arrondie d'où son utilisation comme arbrisseau d'ornement. Il n'a pas d'épines et fleurit rarement. Sa production et qualité fourragère a été comparée à celle de la variété* monophylla *et au robinier commun. Pendant 3 ans, la hauteur, la phytomasse et la teneur en MAT des feuilles ont été mesuré sur des tiges provenant de plants racinés installés en 1994. La productivité a augmenté de 256% au bout de 3 ans mais est restée très inférieure à celle mesurée sur la variété* monophylla *ou sur le robinier commun mais le rapport bois/feuille s'est avéré meilleur. La teneur en MAT (174g/kg) a été comparable à celle des clones de* monophylla *mais supérieure de 18% à celle du robinier commun.*

***Mots-clés:*** *robinier, hauteur, phytomasse, valeur fourragère, milieu méditerranéen*

## Introduction

Globe locust is one of several botanical varieties of black locust (*Robinia pseudoacacia* L.). It is a small deciduous tree no more than 3.5 m tall. It is called "globe" because it has a global and compact crown, which provides thick shade, a reason for its latin name *umbraculifera.* It has compound leaves with small leaflets. It is virtually a clone, normally grafted on common black locust (Kavvadas, 1956; Keresztesi, 1988; Dini–Papanastasi, 1999).

Globe locust is exclusively used for ornamental purposes along roads in cities, parks, gardens and golf grounds because it is a very beautiful tree. In addition it is very "safe" and "clean" since it has no thorns and produces no flowers (and fruits) which could make sidewalks dirty and slippery after their fall and therefore very dangerous to pedestrians (Dini-Papanastasi, 1999).

In this paper, the productive capacity and nutritive value of globe locust are explored and suggestions are made for its use in the Mediterranean production systems.

## Material and methods

The experiment was carried out in the Farm of the Forest Research Institute, 20 km northeast of the city of Thessaloniki, Greece (40° 35'north latitude and 22° 58' east longitude) at about 25 m altitude. Mean annual rainfall of the area is about 416 mm and mean minimum temperature of the coldest month (January) 0.2° C indicating a semi-arid Mediterranean climate with cold winters.

In 1993, green cuttings of globe locust were collected and placed in the greenhouse where they produced roots under mist. The rooting medium was perlite and IBA (4000ppm for 5") was used as rooting promoting chemical (Dini and Panetsos, 1994). The rooted ramets were subsequently transplanted in plastic bags to develop their root system. In April 1994, when they were one-year old, they were transplanted in the field together with similar-aged saplings of open pollinated families and selected clones of *monophylla* as well as with common black locust (Dini–Papanastasi, 1997). *Monophylla* is a variety of black locust with few leaflets per compound leaf and few and small thorns while the common black locust has compound leaves with many more leaflets and bears stronger thorns. The experimental design was completely randomized with unequal samples and involved 30 rows with 14 plants each at a spacing 2.5 X 2.5m. Altogether, they were planted 420 saplings of which 49 belonged to globe locust. Right after planting and during the first summer the plants were irrigated 2-3 times to ensure good establishment and the field was cleaned of weeds.

Measurements were carried out at the end of growing season (end of October-beginning of November) for three consecutive years (1994, 1995 and 1996). They included plant height and biomass. The latter was measured in a random sample of 20 saplings after clearcutting each of them at 10cm above ground. The cut material was weighted, hand separated into leaves and branches, and weighed again after oven drying at 65° C for 48 hours. Both components of biomass were analyzed for crude protein content in 1994 with the macro-Kjeldahl technique (A.O.A.C., 1990). After the measurements, all plants were cut back so that new growth is produced the following year.

Data obtained from the different genetic materials included in the experiment were subjected to analysis of variance and estimates were made of means and standard errors. Only the results referred to globe locust are presented in this paper.

## Results and discussion

The globe locust showed a much higher and faster rooting ability compared to *monophylla* genotypes tested. In fact more than 80% of the cuttings produced roots and finally survived.

Table 1 shows the results obtained during the first three years since establishment. It is clear that the growth of globe locust was very slow during the first two years but it fastly increased during the third year. More specifically, height was increased by 78% and biomass by 256%. Both these increases were statistically significant. This is a pattern that several woody plants exhibit including black locust (Papanastasis *et al.*, 1997) and suggests that globe locust needs at least two years to get established before it starts producing substantial biomass for any kind of exploitation.

Compared to the other varieties of black locust such as *monophylla* and common, the globe locust was impressively inferior. Its height was making 19% of *monophylla* clones, 18% of *monophylla* families and 17% of common black locust in 1994 and 15%, 15% and 16% respectively in 1995. Its biomass was 8%, 8% and 5% in 1994 and 3%, 4% and 3% in

Table 1. Means with their standard errors of height, dry weight of leaves and twigs of globe locust (1994-1996).

| | Mean values ± standard errors | | |
|---|---|---|---|
| | 1994 | 1995 | 1996 |
| Height (cm) | 27.5±1.6a[(1)] | 32.9±1.9a | 58.6± 2.8b |
| Dry leaves weight (g/plant) | 16.5±2.6a | 23.0±4.7a | 72.0±16.3b |
| Dry twigs weight (g/plant) | 4.5±0.9a | 9.0±1.7a | 42.0± 9.1b |
| Total dry weight (g/plant) | 21.0±3.4a | 32.0±6.4a | 114.0±25.1b |

[(1)] Means in the same row followed by different letters are significantly different (P≤0.05).

1995 respectively (Dini-Papanastasi, 1997). However, the percentage of leaves in the total biomass was much higher in globe locust than in *monophylla* clones and families and in common black locust. More specifically, in 1994 this percentage was 79% in globe locust but only 55% in *monophylla* clones, 46% in *monophylla* families and 38% in common black locust; in 1995 the respective values were 72%, 39%, 34% and 35% (Dini-Papanastasi, 1997). These results suggest that globe locust is more leafy than the two other varieties.

As far as the crude protein content is concerned, figure 1 shows that globe locust was found to be superior to *monophylla* open-pollinated families and to common black locust and it had as much CP as the selected clones of the *monophylla* variety. Similar results were also found by Dini-Papanastasi and Papachristou (1999).

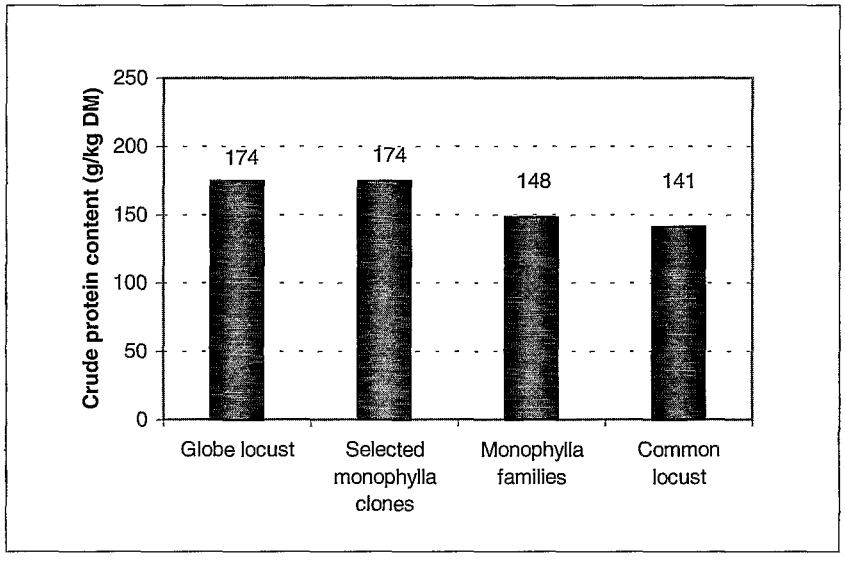


Figure 1. Crude protein (CP) content in globe locust as compared to other varieties of black locust.

Despite its low biomass production, globe locust compares favorably with other fodder native shrubs or shrubby species such as *Carpinus orientalis*, *Corylus avellana*, *Fraxinus ornus*, *Pirus amygdaliformis*, *Quercus pubescens* and *Q. sessiliflora* which have similar productive potential but inferior crude protein content (Papachristou and Papanastasis, 1994; Papanastasis *et al.*, 1997).

On the other hand, the productive potential of globe locust may be substantially increased if it is grafted on rootstock of common black locust. Such a grafting would combine the high growth potential of black locust with the leafy, nutritious and thornless biomass of globe locust thus resulting in an attractive species to be used for strategic forage production in the Mediterranean production systems.

## Conclusion

Globe locust is a slow growing thornless variety of black locust with limited biomass production but with high leaf to twig ratio and increased crude protein content as compared to other varieties of black locust. Its potential as forage species can be impressively increased if it is grafted on rootstock of common black locust so that high production and improved nutritive value are combined.

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