Collecting and breeding Medicago arborea indigenous germplasm in Greece

Vaitsis T., Konstantakis A.

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COLLECTING AND BREEDING MEDICAGO ARBOREA INDIGENOUS GERM PLASM IN GREECE

Vaitsis,Th. Greece Agricultural Research Center
Larissa
Konstantakis Ap.Agricultural Research Station
Rhodos

SUMMARY

Medicago arborea germ-plasm collection has been completed,during 1992,by five populations collected from the islands Kos and Karpathos.
Selection for cold and drought resistance,started some years ago,is in progress.Promising shrubs have been selected to be used as clones,after vagetative propagation,in father breeding work.

A randomized complete plot experiment was established,in autumn of 1991 for agronomical evaluation of nine M.arborea populations in Larissa,Messochori and Rhodos.

INTRODUCTION

Medicago arborea is an interesting nutritive and drought resistant legume shrub suitable for marginal rocky soils reclamation. It could play a significant role in mediterranean extensive livestock production systems. Better animal and bee feeding,soil and plant conservation,better aesthetic vew enviroment protection wild fire and erosion control,are the benifits expected by this shrub introduction in degraded rangeland.

All populations collected are susceptible to the frost but tolerant to the drought.The existing variability on morphological and agronomical characters is large both into and between populations.

This project aims to the following specific objectives:

a. germ-plasm collection to include more variability

b. Selection for cold and drought resistance to produce new populations.
c. Agronomical evaluation of the populations to produce varieties adupted in mediterranean conditions

MATERIALS AND METHODS

Seeds and cuttings have been collected this year (1992) from the Aegean Sea islands Kos and Karpathos from seminatural of wild old Medicago arborea shrubs.

Selection mainly for cold and drought resistance and for some other characters (leafness,forage production,persistance e.t.c,) will be continued in four plantations established in Larissa 4 to 5 years ago. Climatic conditions of Larissa (tab.1. and 2) are favourable both, for cold and drought resistance Selection.

Cuttings,5 to 15 cm long,will be taken from the selected plants in autumn of 1992 or in spring of 1993 to be used in a second cycle of selection.Rooted cuttings developed into black plastic pots (35cmx20cm) will be transplanted in autumn in the field spaced each other 2 m apart.

Nine Medicago arborea polupations have been included in a randomized block experiment to be tested for adaptation,forage production and some other characters in the following three locations:

a.In Larissa (lat. 39°38′,long 22°25′) in a deep,semifertil well prepared soil.
b. In Messochori,40 km mothern than Larissa (lat. 39°45′ long. 22°05′), in a shallow marginal rocky matural pasture.
c. In Kalamona near to Rhodos (lat. 36°15′,long. 28°oo) in a semifertil well prepared soil.

Well developed seedlings,aged about to seven months were trandplanted early in autumn of 1991,in the field

spaced each-other 2 m apart.Dactylis glomerata,variety "Perrevia",was sown in the half of the field as an accompany crop,just after the M.arborea transplantation.

RESULTS AND DISCUSSION

Indigenus germ plasm collection of M. arborea has been completed as it is indicated in table 3.It include 17 accessions,two of them bred varieties,one wild population and all the rest seminatural populations. Collecting must be continued next years to include more variability from Peloponnisos and some other regions of southern Greece. Small seed samples are available to interested sciendtists.

The winter of 1991-1992 was not characterized by extrem low temperatures (-8,5 abs.) but by a very long frost period lasted from early December to the end of the February.It resulted in a better screening for cold resistance.The four older plantations were all susceptible to the frost but all they include some cold resistance plants.A considerable number (17%) of resistant plants was found in a seminatural population from North East Attiki (M-15131)

M.arborea usually,drops the leaves during the long dry-hot period but some shrubs remain evergreen. They are subject for farther evaluation.All shrubs were also evaluated for plant height,diameter,leafness,forage production e.c.t.

Selected plants will be used ,after vagetative propagation,as clones to the next breeding step aimed in producing new M.arborea populations adapted to mediterranean conditions.

All young seedlings (7 months old) transplanted in the field in autumn of 1991 have been well established in the three locations.But later,as the frost came early

in Larissa and Messochori,all overground plant parts were destro ied (90%) and finally 35% of plants were killed (tab. 5 and 6).In Rhodos, where the winter was calm, there was not any damage by frost.

Dactylis glomerata has been established well in Larissa and Rhodos in well prepared soil,but it did not succeed in unprepared soil in Messochori.All overground parts of D.glomerata were absolutely dried during midle summer to early October but there was good recovery after the first autumn rainfall in Larissa.

During the establishement year (November 1991-October 1992) some experimental data have been collected for the nine population performance.Some information on plant hight variability are given in tab. 7.

To sum up, the achievements on M. arborea breeding work are:

1. A considerable indigenous germ-plasm has been collected from Attiki and from Aegean Sea islands.
2. There is a great variability both,between and into the populations collected.
3. Seedlings aged 6 to 7 months can be established well in autumn after the first rainfall
4. In larissa and the suroundings frost is the most limiting factor
5. Promising cold resistant plants have been selected to be used after vagetative propagation in producing new populations.
6. M.arborea under hot and watter stress drops its leaves but the plants are drought resistant.Some shrubs in Larissa remain green even under stress conditions
7. The greek variety "Perrevia" of Dactylis glomerata can be used as accompany crop to improve harbage flora composition.

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TABLE 1 Temperatures of Larissa and Rhodos (C^{O})

Parameters	Larissa		Rhodos	
	1992	expect (1)	1992	expect 2
Annual mean temp.	;	16.0	;	19,3
Coldest month mean(3)	3,6	5,0	10,2	12,6
" " minus	-2,1	0,8	9,5	-
Annual absul. "	-8,5	- 21,5	4,0	-2,8
Hotest month mean (4)	16,7	27,7	26,8	26,6
" " maxima	29,8	33,2	29,2	-
Annual absul, "	37	46,0	35,2	36,0

(1) Mean of 40 years

(2) Mean of 36 >>

(3) January in Larissa, February in Rhodos

(4) July in Larissa

TABLE 2. Rainfall of Larissa and Rhodos (mm)

Months	Larissa		Rhodos	
	1991-1992	expect (1)	1991-92	expect(2)
October	12,5	63	150,5	60,7
November	51,5	63	118,0	84,8
December	-	70	297,8	153,5
Ianuary	7,0	49	-	146,4
February	-	42	48	111,5
March	9,5	46	67	91,7
April	96,5	37	57	26,7
May	45,0	44	8	14,9
June	59,0	28	-	2,7
July	11,7	19	-	-
August	-	17	-	-
Sptember	-	36	-	3,3
Total	378.2	514	746.3	696,1

(1) Mean of 40 years

(2) mean of 26 years

TABLE 3: Medicago arborea germ plasm collection of FCPI

Accessions Code No	Classiofication	Origin	Collecting Year
1.M-11237	Seminatural population	Attiki	1971
2.M-15131	" "	"	1984
3.M-16442	" "	"	1987
4.M-14352	" "	Naxos	1980
5.M-15721	variery (1) Naxos	"	1985
6.M-16731	Variety(I) Naxos 90	"	1990
7.M-15132	Seminatural population	Syros	1984
8.M-15133	" "	"	"
9.M-16911	" "	Rhodos	1991
10.M-16912	" "	"	"
11.M-16913	" "	"	"
12.M-16914	" "	Mytilini	"
13.M-17053	" "	Kos	1992
14.M-17054	" "	Kos	"
15.M-17055	" "	Karpathos	"
16.M-17056	" "	"	"
17.M-17057	Wild population	"	"

1)Muss selection varieties produced by FCPI in Larissa

TABLE 4. Cold and drought resistance variability

Code No of populations	Killed plants %		Sarvived %	
	by frost	by drought (3)	Susceptible to Mod Resist	Resistant
M- 11237 (1)	81	12	4	3
M- 14352 (1)	28	8	58	6
M-15131 (1)	42	6	35	17
M-16442 (2)	33	4	56	7

(1) five years old

(2) three years old

(3) injured by frost and died during the summer

TABLE 5. Susceptility of young shrubs to the frost

Susceptility	Larissa	Messochori	Rhodos
Resistant	2	1.5	97.2
Mod Res. to suscept	8	7,5	-
Susceptible	54	56	-
Died	36	35	2.8*
Total	100	100	100

* By diseases and other reasons,not by the frost.

TABLE 6. Persistance in the first year (1991-92)

Varieties		Survived* plants %		
		Larissa	Messochori(1)	Rhodos
M-11237	Attiki n.p	50	50	100
M 15131	Rafina n.p	85	73	90
M-16442	Acropolis n.p	80	70	100
M-14352	Naxos n.p	75	40	90
M-15721	Naxos m.p	75	60	100
M-16731	Naxos 90 m.p	85	75	100
M-15132	Syros n.p	35	65	100
M-15133	Finikas n.p	25	50	100
M-16891	Italian p	70	90	95

* The other killed mainly by frost in Larissa and Messochori and mainly by diseases in Rodos

TABLES 7. Plant height (CM) in the first year (1991-92)

Varieties	Larissa		Messochori		Rhodos	
	19.11.91	17.9.92	21.11.91	28.9.91	14.11.91	25.9.91
M-11237	57	44	49	48	48	64
M-15131	64	50	57	49	63	81
M-16442	60	49	47	55	54	72
M-14352	51	46	34	46	24	62
M-15721	64	57	55	52	57	80
M-16731	66	51	50	55	58	80
M-15132	67	60	65	57	59	81
M-15133	63	33	66	43	44	66
M-16891	60	45	60	52	59	74