SURVEY ON ASH-TREE MANNA (Fraxinus angustifolia Vahl) PRODUCTIVITY

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Abstract

A survey was carried out on the productivity of ash-tree manna in relation to the following basic parameters: a) levels of fertility elements in the leaves; b) soil-plant fertility element relationship. Results obtained by comparing the yields from four different test areas are given. The most important aspect which emerged was that whatever the amount of nutrients in the soils, including "poor" conditions, the coresponding level of the same elements in the leaves doesn't seem to be influenced.

1. Introduction

Ash-tree manna (Fraxinus angustifolia Vahl) holds an important position among the Mediterranean species of pharmacological value. This unique plant has found an exclusive habitat in the massif of the Madonie mountains, east of Palermo (Sicily - Italy). The many medical uses of the product have been known since ancient times but recently there has been a renewed interest in the species due to the rustic quality of the plant which lives and produces in extremely difficult conditions and could become a valid tree for reafforestation also producing excellent quality wood for refined cabinet-making.

These factors have encouraged research which has obtained preliminary results shown in recent works (Crescimanno et al., 1990, 1991).

There was a negative correlation with the total nitrogen, assimilable phosphorus and organic matter of the soil and a positive correlation with the clay content of the soil itself.

The "optimal soil condition-productivity" for the ash-tree manna is the more barren the soil, the greater the production.

These findings merit further investigations. An analytic evaluation of the principal mineral elements contained in the leaves of individual trees with different levels of production, was carried out in order to find further connections within the soil/plant system. Connections which could improve our knowledge of the principles which regulate them.

2. Material and methods

The trial was carried out in 1991 on four ash-tree groves, planted on different types of soil chosen from those which had been subject of a previous study aiming at the characterization and taxonomic classification of the soil under ash-tree manna.

The soil surveyed belong to the Orders of Alfisols, Inceptisols and Entisols, evolved on flyschoid sequences and show a xeric moisture regime and a thermic temperature regime.

The Alfisols are characterized by a most evident process of removal and transportation of the clay which accumulates in the deeper horizons. The structure is good with medium to coarse blocky and prismatic types which become crumby on the surface. From sub-acid to acid, they show a moderate to low cation exchange capacity, a desaturated exchange complex with a clear prevalence of ion calcium; an organic matter content which, with the exception of the surface horizon, is always low.

In the Inceptisols, the texture, which on the surface ranges from loamy-sandy to clayey, is usually clayey in the deeper horizons. The ever evident structure shows fine and medium blocky types which tend to become prismatic in the B horizon. Neutral or sub-acid, non calcareous, well supplied in organic matter in the upper horizon, they show a moderate cation exchange capacity and an exchange complex dominated by the presence of ion calcium.

The Entisols show a scarce differentiation to the parent material and clear signs of surface erosion. The texture is loamy-sandy, the structure is moderate and the drainage tends to be slow. It results sub-acid, non calcareous, moderately supplied in organic matter and with a low cation exchange capacity.

Soils under ash-tree manna, had not been treated in any way with nutritive elements (neither mineral fertilizers nor green manure). The ash-tree groves, not only differed in the type of soil but, also, in their productivity (Table 1).

Sample leaves were picked from the cv "Verdello", the most diffused in the areas, at weekly intervals, from 9 June to 22 September for a total of 16 pickings. The leaves were always picked between 8 and 9 a.m. from branches without fruit and from the central section covering the whole circumference of the foliage.

In the laboratory the leaves were dried in a ventilated oven at 60° C for 48 hours and after at 105° C until a constant weight was reached.

Adopting widely used methods, the following components were determined from the dry, finely ground substance of the leaves: N (%°); P2O5 (ppm); K (m.e.%); Na (m.e.%); Ca (m.e.%); Mg (m.e.%).

The evolution of the various components of the leaves during the growing season was monitored. We carried out the same analysis on the soils as we have done on the leaves. So we determined the quantity of total nitrogen and assimilable phosphorus and Na, K, Ca, Mg both in the exchangeable and in the soluble form (Table 2)

The results obtained were processed in order to determine any correlations between leaf components and the respective components of the soils.

3. Results

The first results of our investigations, are shown in the diagrams of Figures 1,2,3,4,5 and 6, confirm data observed in woody plant mineral nutrition. The results confirm that the curves of nitrogen, phosphorus, potassium and sodium, show the gradual and continuous decrease of these elements in the leaves during the vegetative seasons, except in incidental and insignificant presence of "peaks".

On the contrary, the amount of calcium and magnesium, which are known as slow moving elements, is constant and their presence in many cases (for instance almond, olives) tend to increase with the age of the leaves.

The most important aspect which emerged was that whatever the amount of nutrients in the soils, including "poor" conditions, the corresponding level of the same elements in the leaves doesn't seem to be influenced, so confirming the extreme rusticity and adaptability of ash-tree manna, which is able to extract the necessary nutritive elements from the soil, in any case.

The behaviour of calcium seems an extreme case because the amount of this element in leaves results inversely proportional to the same element in the soil.

This research has made it possible to obtain nutritive "standards" which are useful for further investigations already in progress.

Future research is planned to estimate the role of phosphorus which is found more in soils and leaves of less productive plants.

Another aspect which we will be considering is the "quality" parameters, through analysis on samples of manna, selected by following a previously established experimental procedure.

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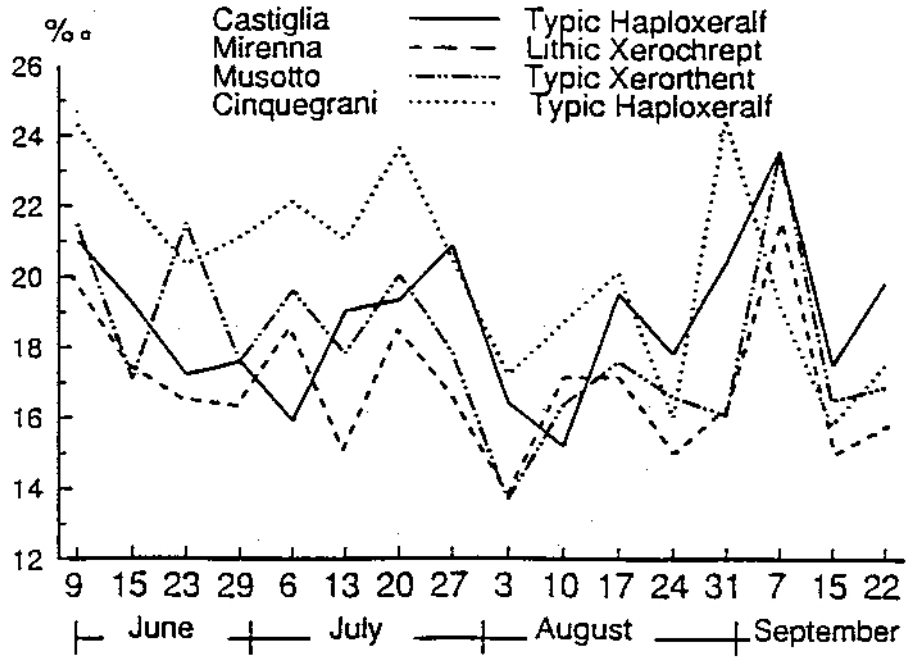

Figure 1 - Course of N in the leaves of ash-tree manna of the farm-test during the period of survey.

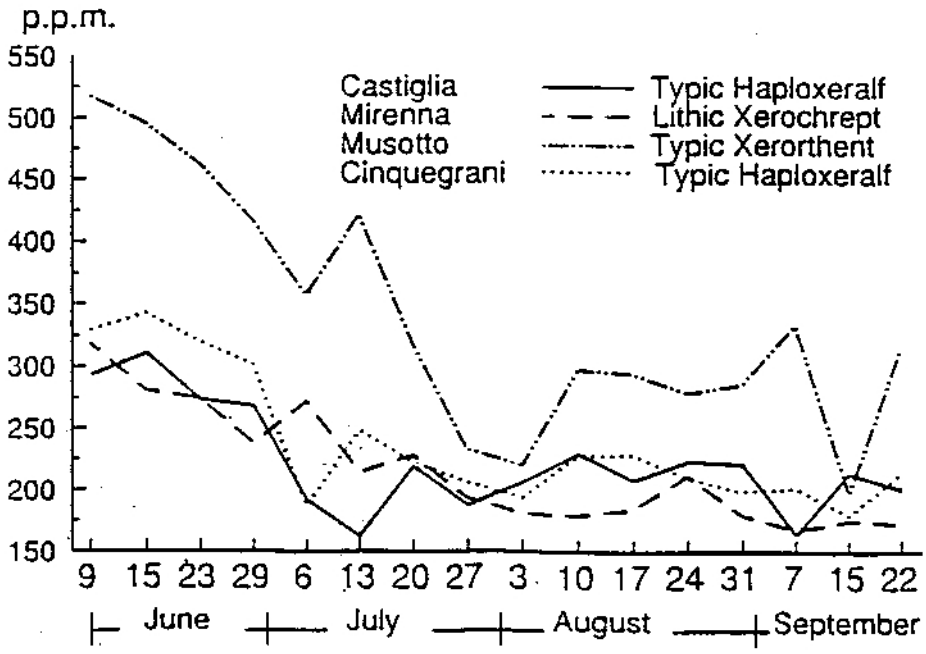

Figure 2 - Course of P_2O_5 in the leaves of ash-tree manna of the farm-test during the period of survey.

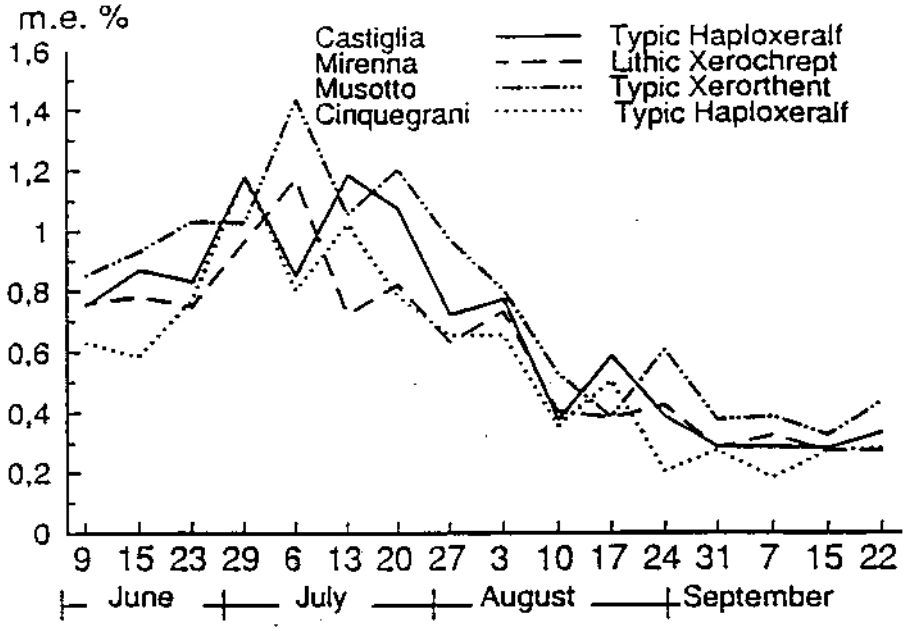

Figure 3 - Course of K in the leaves of ash-tree manna of the farm-test during the period of survey.

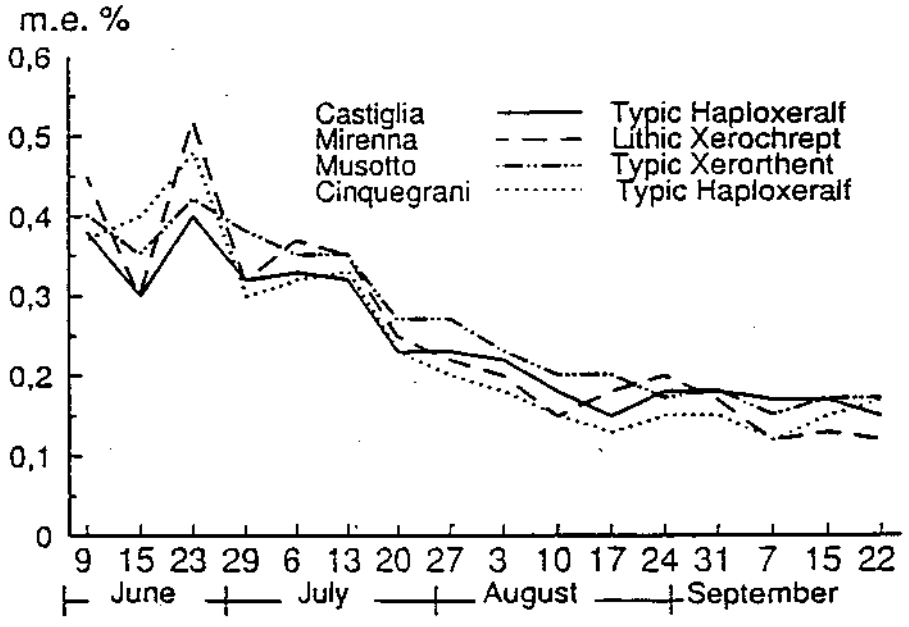

Figure 4 - Course of Na in the leaves of ash-tree manna of the farm-test during the period of survey.

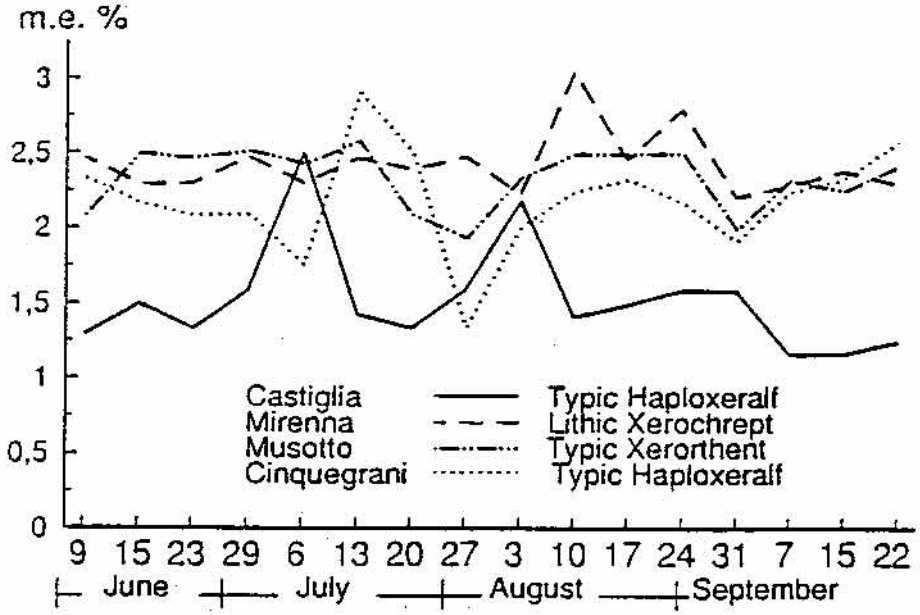

Figure 5 - Course of Ca in the leaves of ash-tree manna of the farm-test during the period of survey.

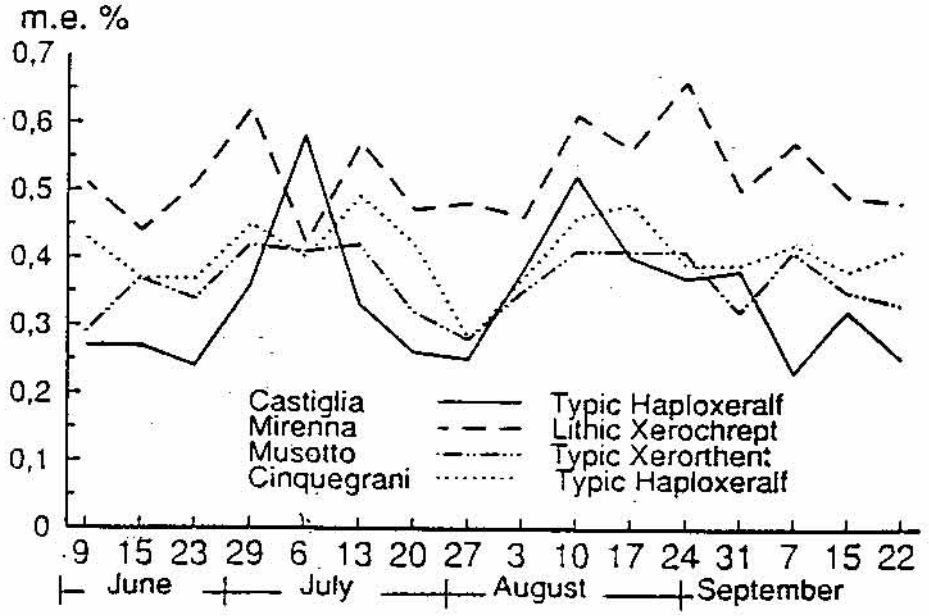

Figure 6 - Course of Mg in the leaves of ash-tree manna of the farm-test during the period of survey.

Table 1 - Production and soil type in the farms chosen for test-areas.

FARM	PRODUCTION (Kg/tree)	SOIL TYPE (USDA)
CASTIGLIA	2.518	TYPIC HAPLOXERALF
CINQUEGRANI	1.617	TYPIC HAPLOXERALF
MIRENNA	0.967	LITHIC XEROCHREPT
MUSOTTO	0.275	TYPIC XERORTHENT

Table 2 - Weighted mean of the elements in the soil profiles surveyed in the farm-test

ELEMENTS	TYPIC HAPLOXERALF	TYPIC HAPLOXERALF	LITHIC XEROCHREPT	TYPIC XERORTHENT
N total %	0.70	0.79	0.98	1.63
P_2O_5 ass ppm	61	77	143	129
K sol m.e.%	0.03	0.02	0.02	0.02
Ca sol m.e.%	0.26	0.15	0.10	0.19
Mg sol m.e.%	0.09	0.06	0.10	0.16
Na sol m.e.%	0.37	0.11	0.11	0.10
K exc m.e.%	0.08	0.02	0.06	0.06
Ca exc m.e.%	13.70	7.89	8.31	10.70
Mg exc m.e.%	4.06	6.95	2.51	5.14
Na exc m.e.%	0.26	0.10	0.11	0.04
FARM	CASTIGLIA	CINQUEGRANI	MIRENNA	MUSOTTO