

## INFLUENCE OF MANAGEMENT AND FERTILIZATION SYSTEMS ON THE BEHAVIOR OF ANNA SPATH PLUM VARIETY

*IANCU MIHAIL\*, GĂGEANU OTILIA\*\**

*\*Institutul de Cercetare – Dezvoltare pentru Pomicultură Pitești, România*

*\*\*O.J.C. Argeș, România*

**Abstract.** The studies were carried out in a plum orchard with Anna Spath cv., grafted on Myrobolan rootstock. This paper shows the results over the past 4 years (2003-2006) of a long term polyfactorial experiment (1990-2006). The soil management on a stripe of 1.40 m wide along the tree row by mulching versus the clean cultivation determined a significant increase of the trunk cross sectional area by 124%, of number in fruit per tree by 153 % in fruit mass by 103% and in fruit yield by 121%. Under the same conditions, the N content in leaves was significantly increased by 121%, K content by 118%, and P content was not different. Generally for the two soil management systems along the tree row, application of N fertilization levels (N50, N100, N150, N200), versus the N0, induced a significant increase in the trunk cross sectional area and fruit yield. The raise of fruit yield is especially owed to the greater number of fruit per tree and less to the fruit weight. Between the parameters of the tree growth and fruiting and the N.P.K contents in leaves, significant and distinctly significant correlations were obtained.

**Key words:** soil management, mulching, fertilization.

### INTRODUCTION

To get high fruit yields of a superior quality and evenly from year to year, use of some proper soil management and fertilization systems is of paramount importance. The soil management system with grass stripes between rows and clean cultivation along the row is presently regarded as one of the mostly used (Hougue and Nielsen 1987). The sod between tree rows even as grass stripes leads undoubtedly to a tree competition for water and N particularly. As a result, the fruit potential is generally lowered (Miller and Glenn, 1985). To reduce as much as possible these negative effects it was improved the tree nutritional conditions by application of various N rates and using as management system along the tree row the mulch resulted from mowing the grass cover between the tree rows. This paper reports the results following the long interdependence of the above mentioned systems on the tree growth and fruiting as well as on the chemical compounds in the leaves of Anna Spath plum variety.

### MATERIAL AND METHOD

The investigations were carried out within an experiment presented in other paper from this Symposium. The following experimental scheme was

organized **A factor**: Soil management system (SMS) as a stripe wide of 1.40 m along the tree row: a1 = clean cultivation (CC) maintained by mechanical disking and herbicide applications; a2 = mulch (MC) as plant material resulted from mowing of grass in the sod stripes between the tree rows. The mulch was applied annually with the plant material from the first mowing in May.

**B factor**: N rate - kg of active ingredient (a.i) /ha.; b1 = N0; b2 = N50; b3 = N100; b4 = N150; b5 = N200. The trees number in the replication plot at a graduation level of B factor was 4. Yearly, over the 4 year study, in each replication plot, 100 leaves were collected usually in late July, NPK content was analyzed in leaves according to the methods used in the Romanian labs. The growth and fruiting parameters were measured by the current methods.

## RESULTS AND DISCUSSION

Over a 4 year period, MC versus CC led to a significant growth in the trunk cross sectional area by 124%, in fruit yield by 121%, in fruit number per tree by 153% and in fruit mass by 103%. Comparing these positive effects over various N fertilization levels, one can see that these effects were higher up to N100 level, thereafter these values being lower. Application of N rates, versus the N0, brought about a significant increase in the trunk cross sectional area by 115% in the fruit yield by 125%, and in the fruit number per tree by 124%, in case of CC along the tree row. In case of MC, this growth was even more pregnant and a significant increase in fruit mass was found (table 1).

Table 1

### Influence of management and fertilizer systems on growth and fruiting of Anna Spath plum cultivar

Studied Characteristics	Annual growth tree trunk area cm <sup>2</sup>		Fruit number/tree		Average Fruit mass - g		Fruit yield t/ha	
	a1	a2	a1	a2	a1	a2	a1	a2
Soil management Sistem (SMS)								
N Fertilizer treatment	12,50	15,00	360	549	35,3	34,9	7,7	10,1
N0	12,75	16,25	463	632	34,4	36,8	9,6	12,0
N50	13,75	18,25	486	709	34,7	35,3	9,7	12,3
N100	15,00	17,25	356	758	34,4	36,8	11,0	12,8
N200	15,00	18,25	494	668	35,4	36,1	10,3	11,5
Average SMS	13,8	17,10	432	663	34,8	36,0	9,7	11,7
5% LSD 1	2,45		86		0,54		1,60	
2	3,36		192		1,21		3,58	
3	3,46		190		1,43		1,60	

SMS a1 = clean cultivation; a2 = mulching.;5% LSD; 1 – average SMS (a1;a2); SMS within the same N fertilizer treatment; 3 = N fertilizer treatments within the same SMS

Generally, the lower positive effects after N application on the fruit mass may be explained by a negative correlation between the fruit mass and number of fruit per tree (Iancu and Negoita, 1996). Application of higher N rates (N100.N150,

N200) versus N50, showed a tendency of improving the above characteristics but not significantly. The positive effects of N applications presented here coincides with those from other papers both with plum (Iancu and Negoita, 1996) and also for other fruit species (Goode et al., 1978; Miller and Glenn, 1985).

On average, over a 4 year period, MC versus the CC led to a significant increase in N content in leaves by 121% and in K content by 118%, but it was insignificant for P content. The greater positive effects in N application were observed with lower rates (N0, N50) becoming lower with higher N rates. Regarding K content, the positive effects were practically similar for all 4 N rates. When N50 was applied, versus N0, a significant increase in N content in leaves by 111% was seen, which coincides with the date reported by other authors (Bunea 1989; Goode et al.1978, Miller and Glenn,1985). This increase was similar for the two SMS. N100, N150, N200 rates, versus N50, did not determine a significant raise of N content in leaves. Application of the 4 N rates versus the N0 induced sometimes a significant raise of P content in leaves but not that of K content.

Table 2

**Influence of management and fertilization systems on some leaf chemical components for the Anna Spath plum cultivar**

Studied Characteristics	Chemical component in leaf					
	N %		P %		K %	
Soil management system (SMS)	a <sub>1</sub>	a <sub>2</sub>	a <sub>1</sub>	a <sub>2</sub>	a <sub>1</sub>	a <sub>2</sub>
N fertilizer treatment						
N0	2,48	2,84	0,270	0,253	2,04	2,41
N50	2,70	3,22	0,281	0,302	2,13	2,46
N100	2,94	3,14	0,244	0,284	2,08	2,40
N150	2,82	3,18	0,220	0,203	2,04	2,46
N200	2,66	2,86	0,218	0,270	1,92	2,25
Average SMS	2,72	3,05	0,247	0,250	2,04	2,40
5 % LSD 1	0,17		NS		0,17	
2	0,39		0,232		0,38	
3	0,18		0,021		0,14	

SMS a<sub>1</sub> = clean cultivation; a<sub>2</sub> = mulching. 5%LSD; 1 – average SMS (a<sub>1</sub>;a<sub>2</sub>); 2 - SMS within the same N fertilizer treatment; 3 = N fertilizer treatments within the same SMS; NS= No significant

Table 3

**Correlation coefficients (R) between chemical leaf components and some growth and fruiting characteristics of Anna Spath plum variety**

Growth and fruiting characteristics	Chemical leaf components		
	N %	P %	K %
Annual trunk growth (cm <sup>2</sup> )	0,48**	N.S.	0,68**
Average fruit mass (g)	N.S.	N.S.	0,34*
Fruit number/tree	0,54**	0,39	0,50**
Fruit yield (t/ha)	0,56**	0,39	0,37*

NS – Non Signifiant

Leaf N content differentiated by the SMS and N fertilizer application were correlated especially with the fruit tree growing and fruit setting processes. These processes occurred more intensely during the first half of the growing season. However, leaf K contents were correlated with the above processes that occurred more intensely in the second half of the growing season (table 3).

### CONCLUSIONS

On average, over the past 4 years of a long term experiment (1990-2006), the soil management on a stripe in 1.40 m wide along the tree row as mulching versus the clean cultivation determined a significant increase of the trunk cross sectional area by 124%, in the fruit number per tree by 153%, in fruit mass by 103% and in yield by 121%. Under the same conditions, N content in leaves was significantly increased by 112%, K content by 118% but the P content did not show a significant difference.

On average for the two soil management systems along the tree row, application of 4 fertilization levels (N50, N100, N150, N200) versus the N0 brought about a significant increase in trunk cross sectional area and in fruit yield. The raise of fruit yield is especially owed to the greater number of fruit per tree and less to the fruit mass. Between the parameters of tree growth and fruiting and N.P.K contents in leaves, significant and distinctly significant correlations were obtained.

### BIBLIOGRAPHY

1. GOODE, J.E., HIGGS, K.H. and HYRICZ, K.J., - Nitrogen and water effects on the nutrition, growth crop yield and fruit quality of orchard grown Cox's orange pippin apple trees. *J. Hort. Sci.* 53(4) 1978, pg. 295-306;
2. HOGUE, F.J., and NIELSEN, G.H., Orchard floor vegetation management. *Hort. Reviews* Vol.9: 377-430, 1987.
3. IANCU, M., NEGOITA, MARIA – Influenta sistemului de intretinere si fertilizare a solului asupra unor componente chimice din frunzele si fructele solului de prun Anna Spath. *Lucr. St. ICPP Pitesti*, 1996 vol. XVIII, p. 354-372.
4. MILLER, S.S and GLENN, D.M., - Influence of various rates of  $\text{Ca}(\text{NO}_3)_2$  fertilizer and soil management on young apple trees *J. Amer. Soc; Hort. Sci.* 110, 1985 p. 237-245.