# INFLUENCE OF MECHANISATION AND FERTILISATION ON TOTAL SOIL POROSITY AT THE DIDACTIC STATION IN TIMIȘOARA, ROMANIA

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***Abstract. Total Porosity (TP)*** *depends on granulometric structure, on the values of apparent density, and on setting degree. The total porosity of the worked horizon has low to medium values (42.00-44.00%), with higher values in the lower horizons (48.00-55.00%). Agricultural practice shows that indeed yielding potential and yields can increase if we use technological machines and equipments, fertilisers, amendments, and control substances; if we practice irrigation, desiccation, drainage, diking, and preventing and control erosion; if we improve labour and knowledge; if we put into practice the results of scientific research, etc.*

***Keywords:*** *total porosity, agricultural practice, production capacity*

## INTRODUCTION

The plantation is located in northern Timișoara; it covers 15.43 ha, of which 7 ha are cultivated with fruit trees and 7 ha are cultivated with grapevine, while the rest of 1.43 ha are access roads and buildings. Though it is a didactic plantation, it could be considered profitable because it is close to Timișoara, which provides the opportunity of selling all its produce on the market at low costs.

The goal of this study was to identify soil types and soil physical features (porosity) of the Didactic Station of Timișoara, Timiș County, Romania.

The goals of this study were mainly to characterise the studied area from the point of view of natural conditions, and to determine soil physical features (porosity).

## MATERIAL AND METHOD

Total soil porosity is an important soil feature because plants and microorganisms thrive only within certain limits of total porosity and aeration; this is why we also studied this soil feature.

***Total Porosity (%)*** was calculated with the formula:

$$PT = \left(1 - \frac{DA}{D}\right) x100$$

## RESULTS AND DISCUSSION

The values of total porosity in the two research years (2014-2015) were determined by calculating the values of apparent density and soil density, as shown in Tables 1 and 2 and Figures 1 and 2 below.

The machines used to spread animal manure are made up of a bin with 2 or 4 wheels, a carrier with knives at the bottom of the bin, and spreading organs (drums with pallets or fingers, or horizontal or vertical worm screws) and working mechanisms on the sides.

The necessary flow depending on the nitrogen fertiliser rate per ha is determined with the formula:

$q = B_e \times v_e \times N/10^4$ (kg/s)

where:

$B_e$ – machine working width (m);

$v_e$ – machine working speed (m/s);

N – fertiliser rate (kg/ha).

Transport is regulated through pawl or worm screw mechanisms allowing speeds between 3 and 90 mm/s.

Because the spreading organs (drums or worm screws) are operated from the power socket of the tractor, it should be kept at nominal speed, i.e. the tractor speed can only be changed if we change the speed. The fertilising aggregate moves in the shuttle manner. To prevent damaging PTO couplings, the aggregate direction should be changed at low speed and without coupling.

*Table 1.*

Influence of fertilisers on soil total porosity per fruit tree row in the intensive system (%)

| Year | Depth (cm) | Factor B | | | | | | Mean (%) | Difference (%) |
|---|---|---|---|---|---|---|---|---|---|
| | | $N_0P_0K_0$ | $N_{70}P_{30}K_0$ | $N_{100}P_{50}K_{20}$ | $N_{150}P_{100}K_{50}$ | g.g. | g.g. + $N_{50}P_{30}K_{10}$ | | |
| 2014 | 0-20 | 47 | 47 | 47 | 46 | 55 | 53 | 49.6 | 2.6 |
| | 20-40 | 45 | 45 | 44 | 44 | 46 | 46 | 45.0 | - |
| | 40-60 | 43 | 43 | 43 | 43 | 44 | 44 | 43.4 | 0.4 |
| 2015 | 0-20 | 47 | 47 | 47 | 46 | 52 | 50 | 48.4 | 1.4 |
| | 20-40 | 44 | 44 | 44 | 44 | 45 | 45 | 44.4 | 0.4 |
| | 40-60 | 43 | 43 | 43 | 43 | 44 | 44 | 43.4 | 0.4 |

Per fruit tree row, soil total porosity in 2014, *0-20 cm deep*, was 46.00% in the variant $b_3$ and 55.00% in the variant $b_4$, compared to 47.00% in the variants $b_0$ and b1, with a mean of 49.60% and a difference of 2.60%; *20-40 cm deep*, total soil porosity was 44.00% in the variants $b_2$ and $b_3$, and 46.00% in the variants $b_4$ and $b_5$, compared to the variant $b_0$, with a mean of 45.00%; *40-60 cm deep*, total soil porosity was 43.00% in the variants $b_0$, $b_1$, $b_2$ and $b_3$, and 44.00% in the variants fertilised organically, with a mean of 43.40%.

*Table 2.*

Influence of fertilisers on soil total porosity between fruit tree rows in the intensive system (%)

| Year | Depth (cm) | Factor B | | | | | | Mean (%) | Difference (%) |
|---|---|---|---|---|---|---|---|---|---|
| | | $N_0P_0K_0$ | $N_{70}P_{30}K_0$ | $N_{100}P_{50}K_{20}$ | $N_{150}P_{100}K_{50}$ | g.g. | g.g. + $N_{50}P_{30}K_{10}$ | | |
| 2014 | 0-20 | 45 | 45 | 45 | 44 | 52 | 49 | 47.0 | 2.0 |
| | 20-40 | 44 | 44 | 44 | 43 | 45 | 44 | 44.0 | - |
| | 40-60 | 43 | 43 | 43 | 42 | 45 | 44 | 43.4 | 0.2 |
| 2015 | 0-20 | 45 | 44 | 44 | 43 | 48 | 47 | 45.2 | 0.2 |
| | 20-40 | 44 | 44 | 43 | 43 | 45 | 45 | 44.0 | - |
| | 40-60 | 43 | 43 | 42 | 42 | 43 | 43 | 42.6 | -0.4 |

In 2015, total soil porosity *0-20 cm deep* was 46.00% in the variant $b_3$ and 52.00% in the variant $b_4$, compared to 44.00% in the variant $b_0$, with a mean of 48.40% and a difference of 1.40% compared to the control variant; *20-40 cm deep*, total soil porosity ranged between 44.00% and 45.00%; *40-60 cm deep*, he values of total soil porosity ranged between 43.00% and 44.00%, with a mean of 43.40%.

Between fruit tree rows, total soil porosity in 2014, *0-20 cm deep*, was 44.00% in the variant $b_3$ and 52.00% in the variant $b_4$, compared to 45.00% in the control variant, with a mean of 47.00% and a difference of 2.00%; *20-40 cm deep*, total soil porosity was 42.00% in the variant $b_3$ and 45.00% in the variant $b_4$, with a mean of 43.40%; *40-60 cm deep*, total soil porosity was 42.00% in the variant $b_3$ and 45.00% in the variant $b_4$, compared to 43.00% on the variant $b_0$, with a mean of 43.40%.

In 2015, total soil porosity *0-20 cm deep* was 43.00% in the variant $b_3$ and 48.00% in the variant $b_4$, compared to 45.00% in the variant $b_0$, with a mean of 45.20%; *20-40 cm deep*, the values of total soil porosity ranged between 43.00% and 45.00%; *40-60 cm deep*, the values of total soil porosity ranged between 42.00% and 43.00%.

## CONCLUSIONS

***Total porosity*** ranged between 43.00 and 55.00% in the intensive system and between 42.00 and 54.00% in the super-intensive system per fruit tree row, and between 42.00 and 52.00% in the intensive system and between 42.00 and 49.00% in the super-intensive system between fruit tree rows. The highest values were when fertilising organically 0-20 cm deep, while the lowest values were in the variant $b_4$, 40-60 cm deep.

The highest values were per fruit tree row and the lowest values were between fruit tree rows.

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