INFLUENCE OF SOIL TYPE AND FERTILIZER APPLICATION ON SOIL NUTRITIVE POTENTIAL

Georgeta Oprea, Gheorghe Zambilă, Vasilica Palanciuc

ABSTRACT

In the modern agriculture, the conservation of soil fertility is a necessity. The intensive agriculture leads currently to the diminution of soil fertility. The problem is to obtain a higher quality and quantity production level, in the same time keeping the fertility quality of the soil. To have the control and obtain this effect is necessary to know the influence of fertilizer application on soil nutritive potential, for different types of soils.The present paper is a synthesis of the soil type and fertilization influence on nutritive potential of the soil in five locations (Fundulea, Ileana, Şimnic, Albota and Valul lui Traian). The nutritive potential of the soil is representend by the following characteristics: the humus composition, nitrogen and organic phosphorus content, the humus extractibility and humic and nitrogen extractibility, respectively the bases saturation degree.

Key words: fertilizer, humus, soil fertility

INTRODUCTION

Chemistry and biochemistry researches of the soil fertility properties have been made by different authors, among which Borlan (1969), Davidescu (1974), Teaci (1980), Eliade (1987). The comun element of these investigations is the concern to establish the numerical indicators of quantification of some parameters which describe the soil nutritive potential.

The paper starts from the idea that crop technology has an important contribution to the preservation and improvement of the fertility qualities of the soil.

MATERIALS AND METHODS

The investigations have been performed under different soil conditions, in long-term experiments:

- the irrigated cambic chernozem (Fundulea);
- the non-irrigated cambic chernozem (Ileana);
- the non-irrigated brown-reddish (Şimnic);
- the non-irrigated albic luvisol (Albota);
- the irrigated carbonated chernozem (Valu lui Traian).

The following experimental variants were adopted:

- V1 without fertilization;
- V2 inorganic fertilizer ($N_{80}P_{80}$);
- V3 manure (20 t/ha) + $N_{80}P_{80}$ limestone (10 t/ha), P and limestone only at Albota.

The soil samples were naturally dryed and grinded. Determinations were carried out on:

- humus content (C, %) using Kjeldahl mathod;
- organic phosphorus content using Legg and Black method (Borlan and Hera, 1973);
- carbon fractions (Ce, extractible carbon, Cah, carbon in humic acids), using Konova-Belcikova method (1961);
- nitrogen fractions, using Bremner method (1968);
- the bases saturation degree, by Kappen method (Borlan and Hera, 1973);
- pH in water, by electromagnetic method.

The humus extractibility (Eh) was determined for all variants with the following calculation formula:

$$Eh = \frac{Ce}{Ct} \cdot 100$$

The humic acid extractibility (Eah) was determined with the formula:

$$Eah = \frac{Cah}{Ct} \cdot 100$$

The results obtained were statistically processed according to the soil type an fertilization.

RESULTS AND DISCUSSIONS

The humus content expressed by the total carbon is presented in figure 1. This indicator varied distinct significantly, depending on the soil type. The highest average level of the humus content was 1.67% on the non-irrigated carbonated chernozem, followed by the irrigated carbonated chernozem (1.64%). On the third place was the irrigated cambic chernozem of Fundulea (1.54%), the lower average

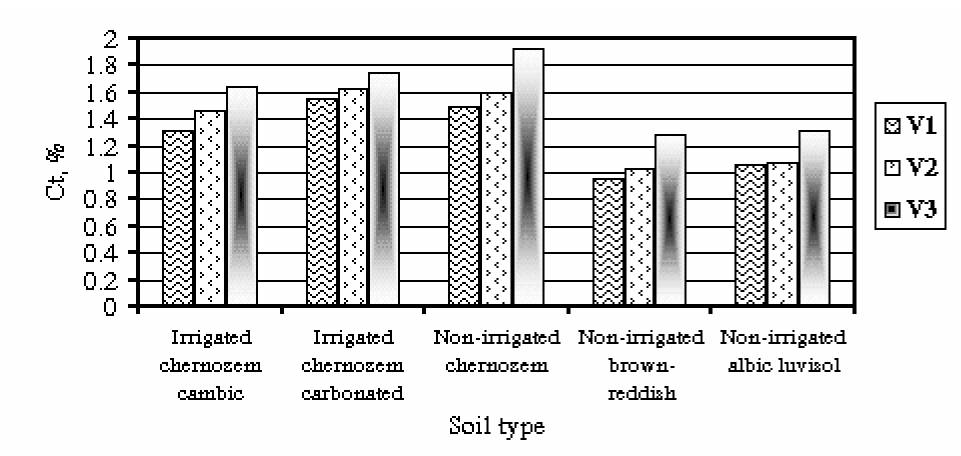

Figure 1. The influence of soil type and fertilization on humus content (Ct, %)

level being recorded on the albic luvisol of Albota (1.14%).

The fertilization variant exerted a distinct significant influence on the humus content, especially in organic-mineral fertlization (1.84%). The lower humus content level was observed at the non fertlized variant on the brown reddish soil.

The nitrogen content is represented in figure 2. The influence of fertilization on the nitrogen content is similar to the influence on the humus content. Significant differences

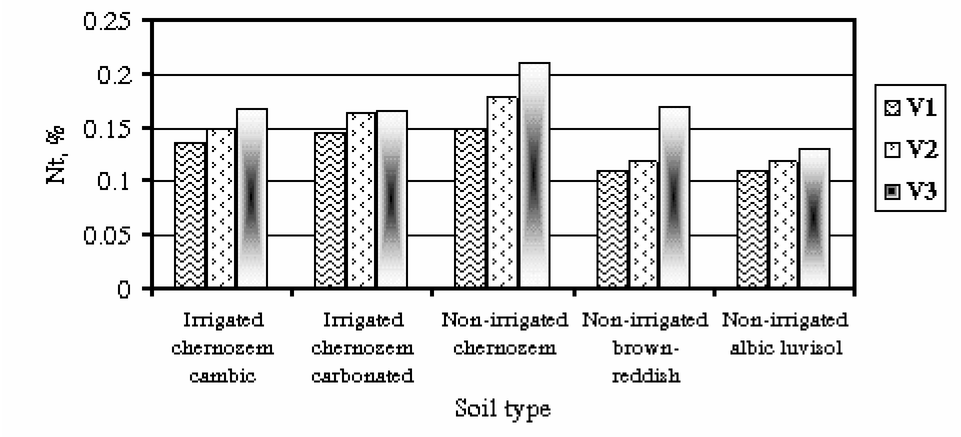

Figure 2. The influence of soil type and fertilization on nitrogen content (Nt, %)

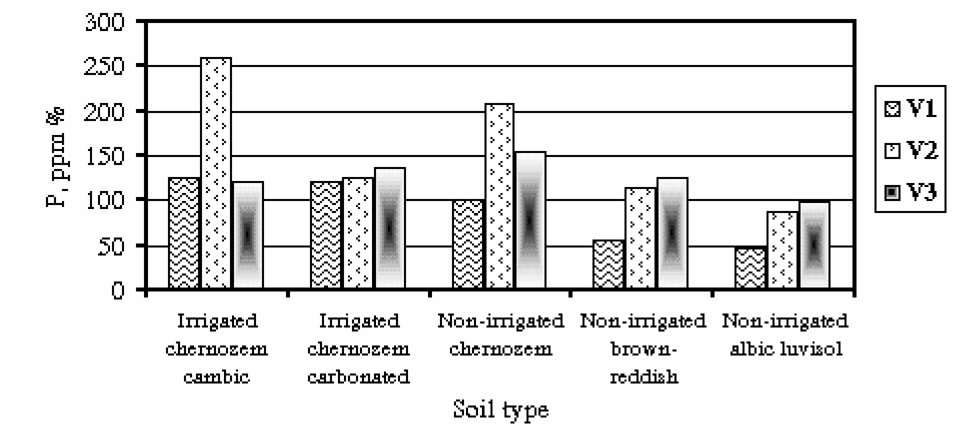

Figure 3. The influence of soil type and fertilization on organic phosphorus content (P, ppm %)

both for the soil type and for fertilization variant are evident. The highest average level was determined in the mineral-organic fertilization on the non-irrigated chernozem from Ileana (0.21%), and the lower level on the non-fertilized albic luviosol and on the brown-reddish soil (0.11%).

In figure 3, the soil type and fertilization influence on the organic phosphorus content of the soil is presented. The organic phosphorus is the main mobile phosphorus source of the soil. The highest level was established on the cambic chernozem of Fundulea and Ileana (169 ppm, respectively 153.9 ppm), followed by carbonated chernozem, brown-reddish and albic luvisol. The mineral phosphorus was strongly included in the soil matrix under chernozem conditions (160.2 ppm at Fundulea and respectively 207.8 ppm at Ileana.

The humus extractibility was established as distinct significant only among different soil types. The fertilization variant does not influence significantly the humus extractibility (Figure 4). The highest value was established on the albic luvisol (75.46%) and the lowest on carbonated chernozem (33.41%).

Distinct significant differences were observed regarding the influence of humic acid extractibility on different soil types and, respectively, the fertilization variants (Figure 5).

The extractibility depends on both factors, the soil type and the fertilization variant, the highest value being recorded on Ileana chernozem, 70-72%.

The lowest value was established at the organo-mineral fertilization variant (V_3), for

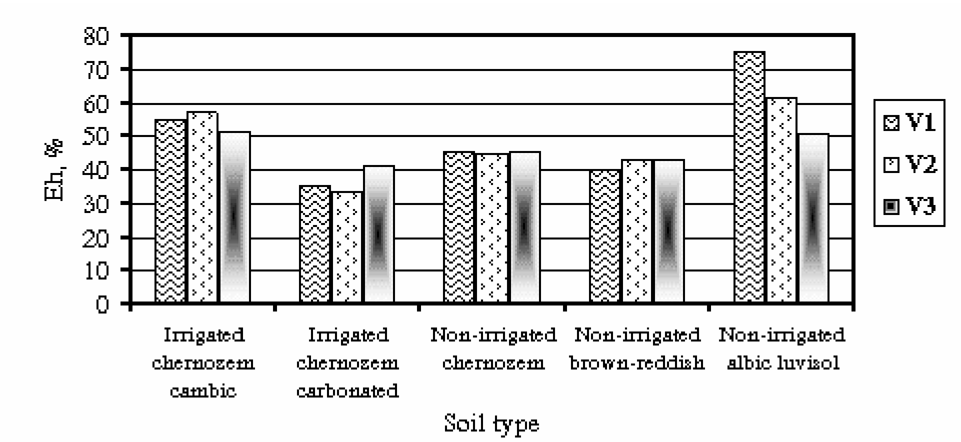

Figure 4. The influence of soil type and fertilization on humus ectractibility (E_h, %)

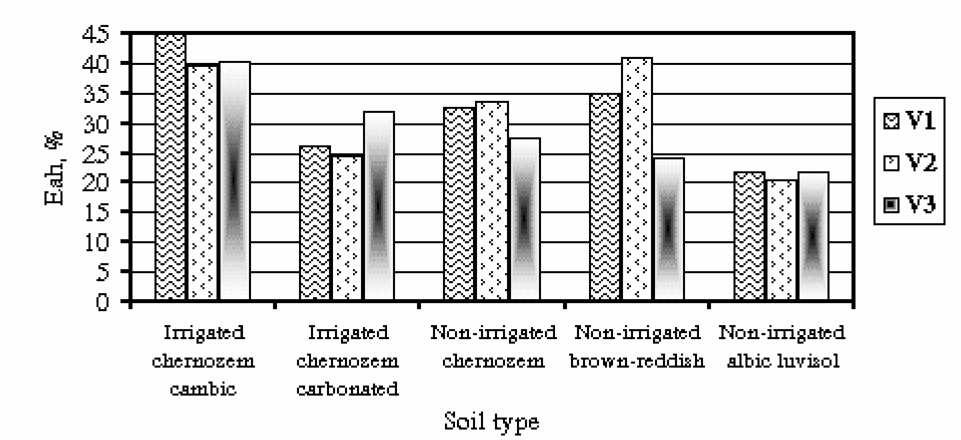

Figure 5. The influence of soil type and fertilization on humic acids extractibility (Eah, %)

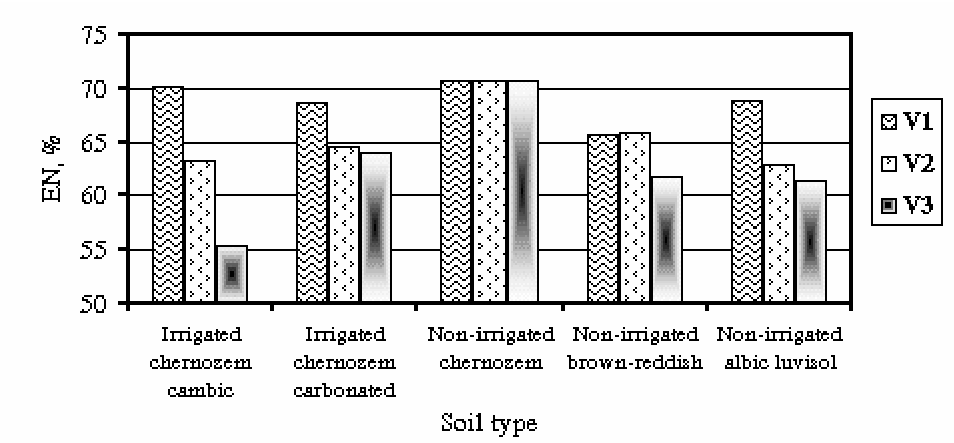

Figure 6. The influence of soil type and fertlization on nitrogen extractibility (nitrogen fraction, E_N, %)

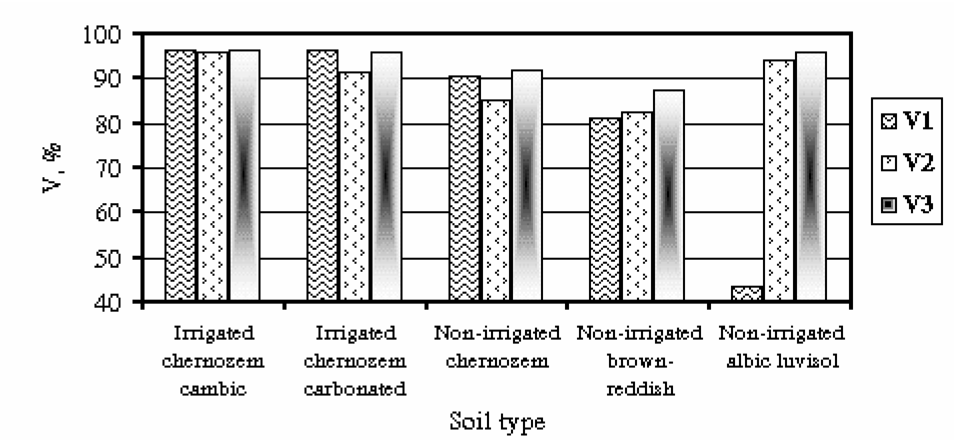

Figure 7. The influence of soil type and fertilization on the bases saturation degree (V, %)

all soil types (Figure 6).

The bases saturation degree varies, also, distinct significantly among different soil types and fertilization variants (Figure 7). It is the highest on the cambic chernozem of Fundulea (96.27%) and on the carbonated chernozem (96.59%) and is higher for all soil types in the mineral-organic fertilization variant (V_3).

CONCLUSIONS

1. The present paper shows the soil nutrient accumulation in the arable soil layer. Using seven parameters (humus content expressed by the total carbon content, total nitrogen content, organic phosphorus content, humus extractibility, humic acids extractibility, nitrogen extractibility, the bases saturation degree), soil fertility could be appreciated without taking into account the yield.

2. The soil type involves a characteristic fertility level, hard to be modified.

3. The mineral fertilization, followed by limestone application, determines a small increase of the acid soil fertility, but produces its reduction in high fertility soils.

4. The manure increases the fertility, but its quality is very important.

5. Data including the seven parameters studied in this paper could be used for a multicriterial mathematical model to evaluate the soil fertility situation.

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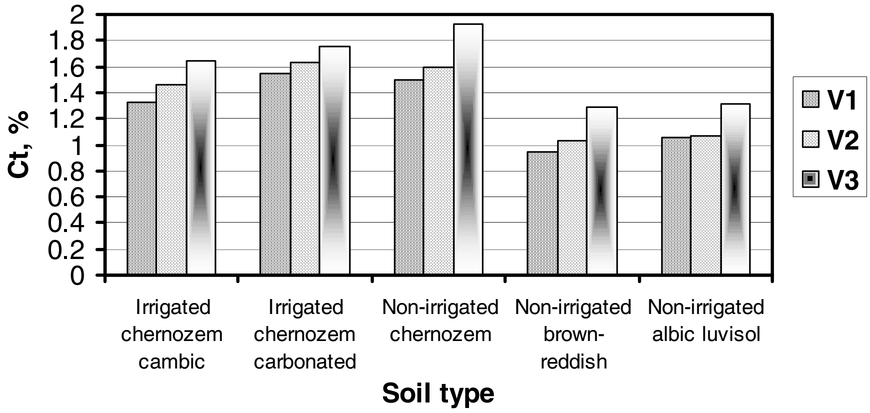

Fig. 1 The influence of soil type and fertilization on humus content (Ct, %)

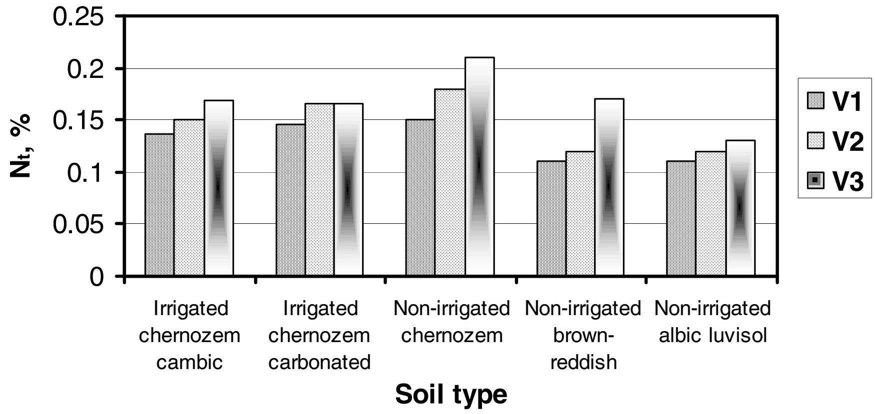

Fig. 2. The influence of soil type and fertilization on nitrogen content (Nt, %).

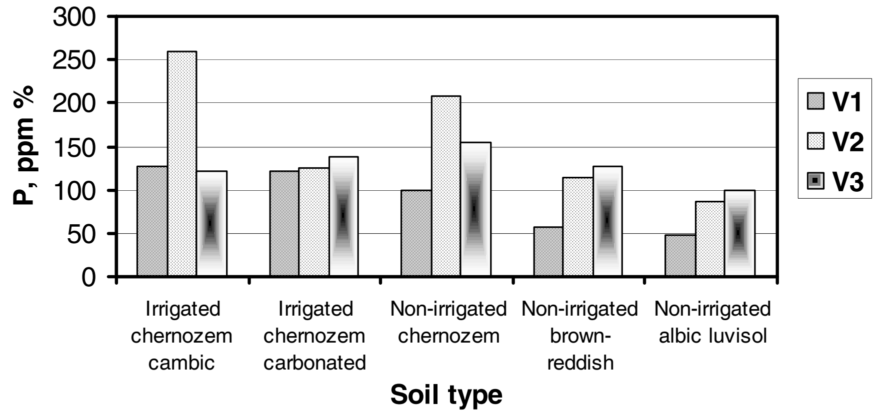

Fig. 3. The influence of soil type and fertilization of organic phosphorus content (P, ppm %).

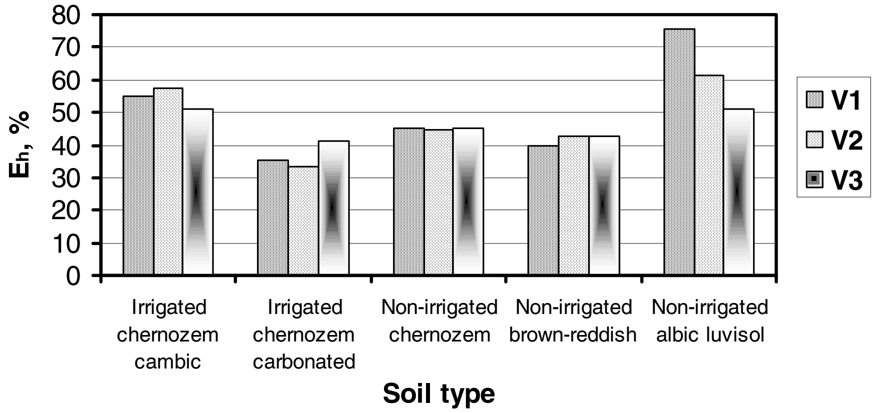

Fig. 4. The influence of soil type and fertilization on humus ectractibility (E_h, %).

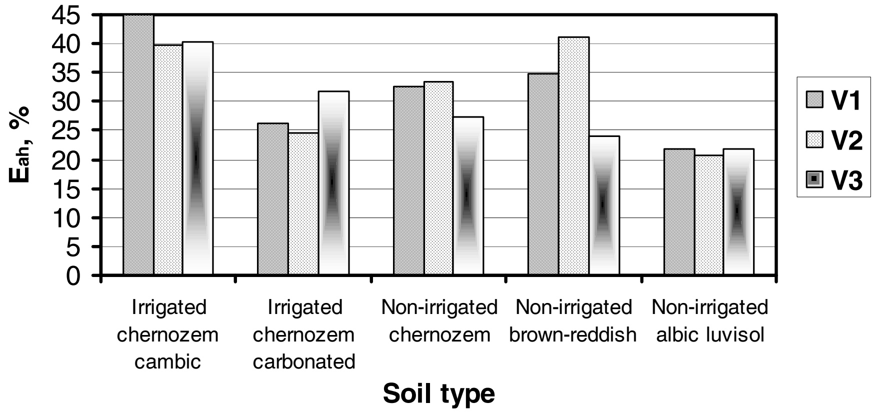

Fig. 5. The influence of soil type fertilization on humic acids extractibility (Eah, %).

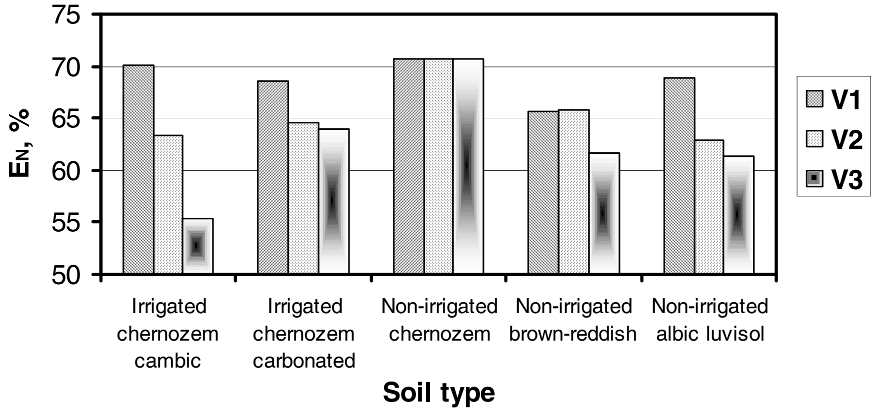

Fig. 6. The influence of soil type and fertlization on nitrogen extractibility (nitrogen fraction, E_N, %).

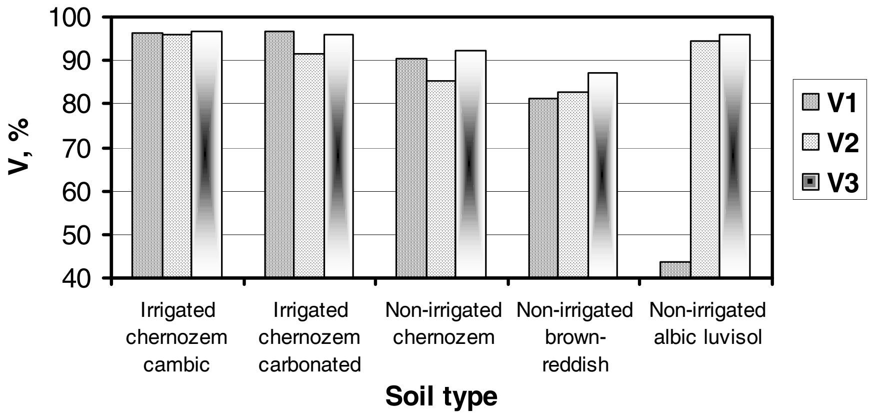

Fig. 7. The soil type and fertilization on the bases saturation degree (V, %).