# CONTRIBUTIONS REGARDING OPTIMAL SYSTEM FOR MINERAL FERTILIZATION AT FEED SORGHUM CULTURE, IN OLTENIA CENTRAL AREA

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**Abstract**
*In our country there are a lot of surfaces with sandy soils and soils with a high concentration of salts, but the lack of some productive soils and free of tannin made that this plant to be less used than the corn.*
*The macro-elements consumption at sorghum culture, in natural conditions is made at level of $P_{70}N_{80-100}$, with appliance of Phosphorous under sorghum work of the soil and Nitrogen at preparation of germinative bed under work with disk*.
***Key words: mineral fertilization, feed sorghum, production, fertilization doses***

## INTRODUCTION

In the experiments made on salty and sandy environments with sorghum hybrids for beans have been obtained very valuable results, in the way that these offered productions 3 times bigger, in comparison with corn (Cotigă, C. 2012).
Also, the salty and sandy soils will be able to be exploited more by sorghum cultivation (Bîlteanu, Gh. 1989; Bărbulescu, C. and collab. 1991).
Sorghum is cultivated for beans respectively for extraction from strain of sweet juice, very high in sugar, for green feed, silo or pasture (in case of hybrids free of tannin) (Cosmin, O., and collab. 1987).
In many countries, sorghum is used with very good results at the production of combined feed. Luvosols are found in hill and plateau areas. They occupy depressed lands, flat lands with poor global drainage. It is characterized by weak bioaccumulation processes. They are found in the forest area of hills and hills, the Transylvanian plateau, the Getic Piedmont. They were formed on materials poor in calcium elements, clays, clays. Relief: flat or slightly depressed. In general, in the area of this type of soil, the climate is humid and cold, temperatures 7-9 $^{o}$C, precipitation 600-1000 mm. The hydric regime, typically percolative. Pedogenetic processes: eluviation-iluviation, bioaccumulation is reduced, therefore smaller amounts of humus result. The texture is differentiated on the profile. Fertility is variable depending on nitrate. It is lower due to the E horizon, with its coarse structure. Through the decomposition of plant residues by fungi and fewer bacteria, little, low-quality humus results, in which fulvic acids predominate. The alteration of the mineral matter is intense, clay is formed, which accumulates at the level of the Bt horizon. The debaseification of the colloidal complex leads to the enrichment of the soil in $H^{+}$ and $Al^{+++}$ ions, which accentuate the acidity of the soil.

## MATHER AND METHOD

Experiments have been set on luvisols from S.C.D.A. Simnic according to subdivided plots, in four repetitions.
Factors taken into consideration, within study were:
“A” factor, Phosphorous and Potassium doses, with 3 graduations:

a1 = $P_0$
a2 = $P_{70}$
a3 = $P_{70}K_{50}$

„B" factor Nitrogen fertilization doses, with 4 graduations:

b1 = $N_0$
b2 = $N_{50}$
b3 = $N_{100}$
b4 = $N_{150}$

Fertilizers based on Phosphorous and Potassium have been applied at establishment of culture, under soil base work during Nitrogen was applied on harvesting cycles.

Sorghum seed has been bought from EURALIS company, that distributes in exclusivity in Romania sorghum hybrids free of tannin.

Sowing have been performed mechanically with SPC-6, at a distance of 70 cm between lines, using a norm of 12 kg/ha useful seed.

Harvesting has been performed at fully maturity of beans, plants from each variant being cut off and then were collected separately beans and strains + leaves.

## RESULTS AND DISCUSSIONS

If is analysed the results obtained and presented in Table 1 referring to influence of Phosphorous and Potassium doses over total production (beans + strains +leaves) at sorghum culture for feed, on average on those 3 research years, we found the following:

Table 1. Influence of Phosphorous and Potassium doses over total production (beans + strains +leaves) at feed sorghum (average 2020 – 2022) t/ha s.u.

| Doses of P and K | Beans 2020-2022 | Strains + leaves 2020-2022 | Total production 2020-2022 | Relative prod. % | Diff. | Sign. |
|---|---|---|---|---|---|---|
| $P_0$ | 3,1 | 4,2 | 7,3 | 100 | Mt | - |
| $P_{50}$ | 5,6 | 6,7 | 12,3 | 168 | 5,0 | *** |
| $P_{50}K_{50}$ | 5,4 | 6,5 | 11,9 | 163 | 4,6 | ** |

Dl5% 2,2 t/ha s.u.
Dl1% 4,7 t/ha s.u.
DL 0,1% 6,6 t/ha

Beans production oscillated between 3,1 t/ha s.u. at variant $P_0$ respectively 5,6 t/ha s.u. at variant that received $P_{70}$, while strains + leaves production situated between 4,2 t/ha s.u. at variant $P_0$ respectively 6,7 t/ha s.u. at variant that received $P_{70}$ .

Referring to total production (beans + strains + leaves), it oscillated between 7,3 t/ha s.u. at variant free of Phosphorous ($P_0$ ) respectively 12,3 t/ha s.u. at variant that received Phosphorous in dose of $P_{70}$ at which has obtained also the maximum harvest increase of 5,0 t/ha s.u., very significant from statistics point of view compared to variant taken into consideration at witness.

At variant at which the fertilization system was $P_{70}K_{50}$, we see that the potential hasn't been quantified at crop enhancement, therefore has no justification in its application on luvisols from S.C.D.A. Simnic (Fig.1).

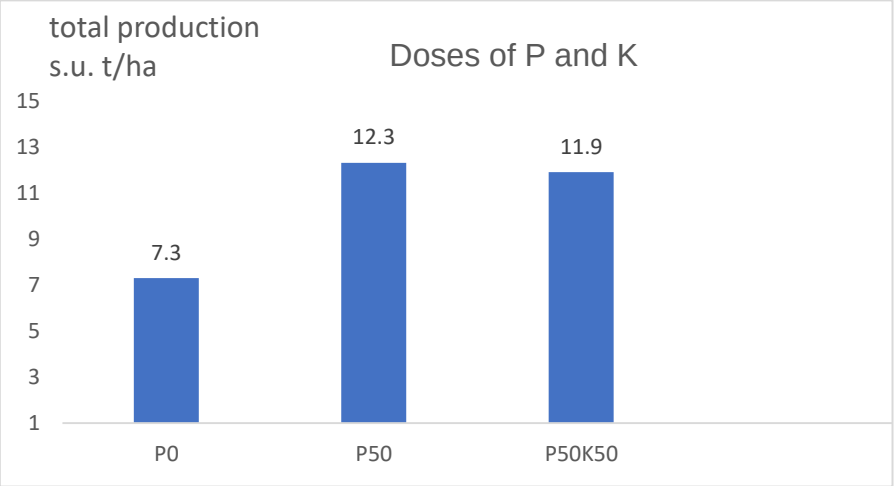


Fig. 1. The effect of Phosphorous and Potassium doses over total production (beans +strains +leaves) at feed sorghum culture in Oltenia central area (average 2020 – 2022)

If we make reference to influence of Nitrogen doses over total production (beans +strains +leaves) at feed sorghum, we can mention the following (Table 2)

Table 2. Influence of Nitrogen doses over total production (beans +strains +leaves) at feed sorghum (average 2020 – 2022) t/ha s.u.

| Nitrogen doses | Beans 2020-2022 | Strains +leaves 2020-2022 | Total production 2020-2022 | Relative prod. % | Diff. | Sign. |
|---|---|---|---|---|---|---|
| $N_0$ | 2,5 | 3,1 | 5,6 | 100 | Mt | - |
| $N_{50}$ | 4,3 | 5,0 | 9,3 | 166 | 3,7 | * |
| $N_{100}$ | 7,3 | 7,7 | 15,0 | 268 | 9,4 | *** |
| $N_{150}$ | 7,1 | 7,4 | 14,5 | 259 | 8,9 | ** |

| | |
|---|---|
| Dl5% | 3,1 t/ha s.u. |
| Dl1% | 6,0 t/ha s.u. |
| DL0,1% | 9,0 t/ha s.u. |

- according to Nitrogen doses taken into study, the beans production oscillated between 2,5 t/ha beans ($N_0$) respectively 7,3 t/ha beans ($N_{100}$) while, strains +leaves production oscillated between 3,1 t/ha ($N_0$) and 7,7 t/ha ($N_{100}$).
- referring to total production (beans +strains +leaves) these ranged between 5,6 t/ha s.u. ($N_0$) respectively 15,0 t/ha s.u.($N_{100}$) with an increase of 9,4 t/ha s.u. in comparison with witness taken into consideration, very significative in statistical terms.
-at application of a Nitrogen dose of $N_{150}$, total production was lower, namely 14,5 t/ha s.u. at which performed increase of 8,9 t/ha s.u. was distinctly significant in statistical terms. (Fig.2).

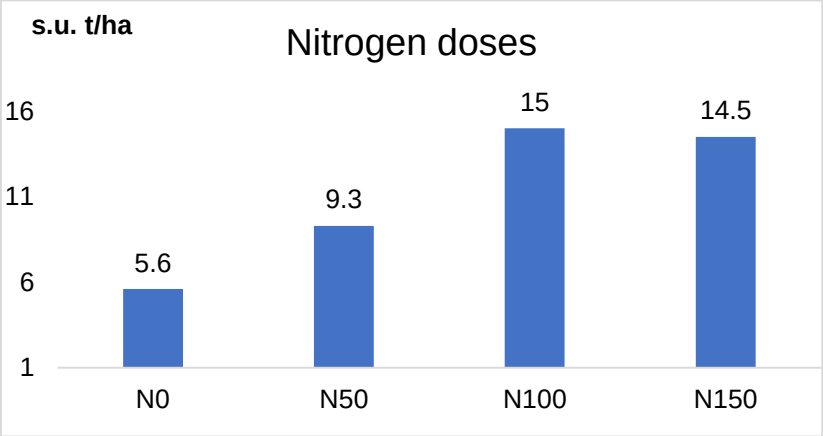


Fig. 2 The effect of Nitrogen doses over total production (beans +strains +leaves) at feed sorghum culture in Oltenia central area (average 2020 – 2022)

Regarding the chemical composition of sorghum beans, according to fertilization system with Phosphorous and Nitrogen (Table 3) we can mention the following:

*Table 3.* Chemical composition of sorghum beans, according to mineral fertilization system (average 2020 – 2022)

| Mineral fertilization system | % of s.u. | | | | | |
|---|---|---|---|---|---|---|
| | | Protein | Celluloses | Co | P | K |
| $P_0$ | $N_0$ | 9,1 | 1,9 | 0,05 | 0,40 | 0,55 |
| | $N_{50}$ | 9,5 | 1,8 | 0,06 | 0,38 | 0,54 |
| | $N_{100}$ | 9,8 | 1,7 | 0,07 | 0,35 | 0,53 |
| | $N_{150}$ | 10,2 | 1,6 | 0,06 | 0,31 | 0,51 |
| $P_{50}$ | $N_0$ | 9,7 | 1,8 | 0,06 | 0,43 | 0,59 |
| | $N_{50}$ | 10,8 | 1,6 | 0,05 | 0,42 | 0,54 |
| | $N_{100}$ | 12,7 | 1,5 | 0,07 | 0,38 | 0,53 |
| | $N_{150}$ | 12,9 | 1,3 | 0,05 | 0,35 | 0,50 |
| $P_{50}K_{50}$ | $N_0$ | 9,5 | 1,5 | 0,03 | 0,49 | 0,56 |
| | $N_{50}$ | 10,7 | 1,4 | 0,06 | 0,45 | 0,57 |
| | $N_{100}$ | 12,6 | 1,3 | 0,06 | 0,42 | 0,57 |
| | $N_{150}$ | 12,7 | 1,1 | 0,05 | 0,40 | 0,55 |

- the protein percent has ranged between 9,1% ($P_0N_0$) respectively 12,9% ($P_{70}N_{150}$);
- when it was $P_0$, the production oscillated between 9,1% ($N_0$) respectively 10,2% ($N_{150}$);
- when it was $P_{70}$, the production oscillated between 9,7% ($N_0$) respectively 12,9% ($N_{150}$);
- when it was $P_{70}K_{50}$, the production oscillated between 9,5% ($N_0$) respectively 12,7% ($N_{150}$).
- the content of beans in cellulose oscillated between 1,1 - 1,9% while at P and K are in optimal range of animals' feed.

## CONCLUSIONS

1. Sorghum is a plant perfectly adapted to ecopedological conditions in Oltenia central area.
2. Beans and respectively strains +leaves production at sorghum, consequently total production has similarly risen from fertilization level of $P_0$ to that of $P_{70}$, therefore on luvisols from research area is needed fertilizers intervention based on Phosphorous.
3. Also, beans and respectively strains and leaves production at sorghum, consequently total production has risen according to Nitrogen fertilization, from 5,6 t/ha ($N_0$) to 15,0 t/ha s.u.($N_{100}$), when it has been obtained the maximum increase of harvest of 9,4 t/ha s.u.
4. Under influence of Nitrogen doses, the gross production at sorghum suffered major modifications and also the content in main mineral salts is registered in optimal limits, fact which proves nutritive value of the sorghum.

*Fig. 3,4. Sorghum*

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