

Deac, Valeria; Chețan, Felicia; Chețan, Cornel; Șimon, Alina; Mureșanu, Felicia

Conference Paper

The influence of mineral fertilization upon production and quality of spring barley on agricultural research and development station Turda

Provided in Cooperation with:

The Research Institute for Agriculture Economy and Rural Development (ICEADR), Bucharest

Suggested Citation: Deac, Valeria; Chețan, Felicia; Chețan, Cornel; Șimon, Alina; Mureșanu, Felicia (2017) : The influence of mineral fertilization upon production and quality of spring barley on agricultural research and development station Turda, In: Agrarian Economy and Rural Development - Realities and Perspectives for Romania. 8th Edition of the International Symposium, November 2017, Bucharest, The Research Institute for Agricultural Economy and Rural Development (ICEADR), Bucharest, pp. 181-184

This Version is available at:

<https://hdl.handle.net/10419/190896>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

THE INFLUENCE OF MINERAL FERTILIZATION UPON PRODUCTION AND QUALITY OF SPRING BARLEY ON AGRICULTURAL RESEARCH AND DEVELOPMENT STATION TURDA

VALERIA DEAC¹, FELICIA CHEȚAN², CORNEL CHEȚAN³, ALINA ȘIMON⁴,
FELICIA MUREȘANU⁵

Abstract: *In order to clarify some aspects of the spring barley reaction on the production and accumulation of the protein in grain, at different levels of fertilization, some estimates of this chemical component were made at 16 levels of fertilization with N: P: K in the period 2016-2017. The increase in protein content was achieved at the highest levels of nitrogen and phosphorus, even when potassium fertilizers were not used, but the highest protein content in grain accumulating at the level of $N_{60}P_{80}K_0$ was 11.78%. The highest yield can be attributed to the fertilization variant $N_{120}P_{80}K_{40}$, which confirms the negative relationship between production and protein content.*

Keywords: *climacteric conditions, quality, fertilization, spring barley, yield*

Classification JEL: Q 01, Q15, Q16

INTRODUCTION

Establishing a fertilization program is based on the relationship between the soil chemical structure and the productive potential of the spring mesh, the fertilizer problems have two essential aspects related to the destination of the crop, for beer or forage. It is known that generally higher nitrogen doses increase the content of protein in the bob, which is not desirable if the destination is brewing and desirable in the case of animal feed. Consequently, besides the many aspects related to the optimal doses of fertilizers (pre-plant, resistance to fall, soil moisture, roots system, etc.), we must also take into account the use of the crop. In addition to the genotype factor, a particularly important role in achieving higher, quantitative and qualitative barley productions has proper fertilization. Another important aspect in establishing an optimal fertilization plan is the short vegetation period, 90-120 days in case of spring barley, and the intense absorption rate of mineral substances. According to Maior (2005), nitrogen fertilizers increase grain protein content and protein yield at the surface unit by increasing grain yield. Phosphorus fertilizers influence protein production/ha only by increasing the grain yield and not the protein content of the grains (Maior, 2005). Potassium is one of the most important nutrients used in agriculture, which, in the conditions of high quality plant and quality objectives for consumers, is constantly increasing its effects and contributing to its realization.

From national or international experiences, it has been noticed that on soils with low N content, the use of moderate doses of fertilizers with this element leads to increased production but has little or no influence on the increase in protein content, the increase of which is influenced in a way significant only by the use of high doses with N.

¹ PhD.Eng. Deac Valeria, SR, AGRICULTURAL RESEARCH AND DEVELOPMENT STATION TURDA, e-mail: valideac2004@yahoo.com

² PhD.Eng. Chețan Felicia, SR, AGRICULTURAL RESEARCH AND DEVELOPMENT STATION TURDA, e-mail: felice_fely@yahoo.com

³ PhD.Eng. Chețan Cornel, SR, AGRICULTURAL RESEARCH AND DEVELOPMENT STATION TURDA

⁴ PhD.Eng. Șimon Alina, SR, AGRICULTURAL RESEARCH AND DEVELOPMENT STATION TURDA

⁵ PhD.Eng. Muresanu Felicia, SR I, AGRICULTURAL RESEARCH AND DEVELOPMENT STATION TURDA

MATERIALS AND METHODS

Research was conducted at ARDS Turda, in the long-term experiments NP (nitrogen and phosphorus fertilizer), on chernozem soil during the years 2016 and 2017.

Experiences have taken place in a five-year rotation; soybean-soybean-wheat-wheat maize and corn, is placed in randomized blocks with 25 variants in 6 repetitions.

The experimental factors and their graduations were: the year of culture: 2016 and 2017; phosphorus doses with five graduations: P₀; P₄₀; P₈₀; P₁₂₀ and P₁₆₀; Nitrogen doses with five graduations: N₀; N₃₀, N₆₀, N₉₀ and N₁₂₀.

The biological material used in this experience was represented by the Romanița cultivar created at ARDS Turda, with a wide range of spreading in the favorable areas of spring culture and mostly in the southern parts of the country. It is a medium-sized cultivar but with fairly good tolerance to fall due to sclerenchymatic tissue resistance and elasticity of the straw. The spikes are approximately 14 cm long, lax to semilax, slightly curved and light yellow in color. The beans are large, globular, golden yellow, with a MMB around 44-52 g and a good germ energy. The higher protein content of this variety, around 12.5%, involves some restrictions on fertilization, especially when production is for beer production. Due to the higher height of this variety, we recommend the use of moderate doses of nitrogen, especially on soils with good fertility, and if growth retardants are not used to avoid plant fall.

RESULTS AND DISCUSSION

The variance analysis (Table 1) reflects the very significant influence of fertilizer doses on the production of the spring barley production. Sample F shows that nitrogen fertilizers have the greatest influence and crop years do not significantly influence production; from the analysis of climatic data results that they were very close to favoring this culture.

Table 1. Variance analysis for grain production (kg / ha), spring barley, NP fertilization system (Turda 2016-2017)

| Sursa variației | GL | s ² | Sample F |
|----------------------|-----|----------------|-------------|
| Years in culture (A) | 1 | 7340 | 0.096 |
| Phosphorus dose (P) | 4 | 2224037 | 60.160*** |
| Nitrogen dose (N) | 4 | 87132290 | 2248.967*** |
| AxP | 4 | 373385 | 10.100 |
| AxN | 4 | 732975 | 18.919 |
| AxPxN | 16 | 468203 | 12.085*** |
| Error A | 5 | 76764 | |
| Error P | 40 | 36968 | |
| Error N | 200 | 38743 | |
| Total: | 299 | | |

From the data presented in Table 2 it follows that in 2016, the best fertilizer variant was N₉₀P₈₀, and in 2017 N₉₀P₁₂₀.

Table 2. Production results (kg / ha) at different levels of fertilization obtained at spring marshland in the years 2016-2017

| Year | | 2016 | | 2017 | |
|---------------------|------------------|--------------------|-------------|--------------------|-------------|
| Fertilization doses | | Production (kg/ha) | Witness (%) | Production (kg/ha) | Witness (%) |
| P ₀ | N ₀ | 2847 | 100.0 (Mt) | 3237 | 100.0 (Mt.) |
| | N ₃₀ | 4255 | 149.5 | 4467 | 138.0 |
| | N ₆₀ | 5382 | 189.1 | 5282 | 163.2 |
| | N ₉₀ | 5753 | 202.1 | 5889 | 181.9 |
| | N ₁₂₀ | 6141 | 215.7 | 5541 | 171.1 |
| P ₄₀ | N ₀ | 3267 | 114.8 | 3439 | 106.2 |
| | N ₃₀ | 4996 | 175.5 | 4478 | 138.3 |
| | N ₆₀ | 5478 | 192.4 | 5321 | 164.4 |
| | N ₉₀ | 6163 | 216.5 | 6481 | 200.2 |
| | N ₁₂₀ | 6121 | 215.0 | 6379 | 197.1 |
| P ₈₀ | N ₀ | 3358 | 117.9 | 3341 | 103.2 |
| | N ₃₀ | 4964 | 174.4 | 4965 | 153.4 |
| | N ₆₀ | 6431 | 225.9 | 5475 | 169.1 |
| | N ₉₀ | 6500 | 228.3 | 6220 | 192.2 |
| | N ₁₂₀ | 5604 | 196.8 | 5920 | 182.9 |
| P ₁₂₀ | N ₀ | 3452 | 121.3 | 3360 | 103.8 |
| | N ₃₀ | 5145 | 180.7 | 4684 | 144.7 |
| | N ₆₀ | 5583 | 196.1 | 5572 | 172.1 |
| | N ₉₀ | 6397 | 224.7 | 6687 | 206.6 |
| | N ₁₂₀ | 5819 | 204.4 | 5905 | 182.4 |
| P ₁₆₀ | N ₀ | 3406 | 119.6 | 3417 | 105.6 |
| | N ₃₀ | 4971 | 174.6 | 4574 | 141.3 |
| | N ₆₀ | 6174 | 216.9 | 6293 | 194.4 |
| | N ₉₀ | 6279 | 220.5 | 6762 | 208.9 |
| | N ₁₂₀ | 5487 | 192.7 | 6529 | 201.7 |

DL (p 5%) 224

DL (p 1%) 295

DL (p 0.1%) 380

In spring crops, as with other crops, the protein content is closely related to the nitrogen dose and the protein content in all experimental variants is higher in 2016 compared to 2017 (Table 3). As it is known, the starch content of barley for beer should be between 55-60%, noting that it drops to variants with a higher protein content. Good results in terms of protein and starch content were obtained in the N₆₀P₈₀ fertilizer variant, which is even more economically efficient.

Table 3. Protein content and starch content (%) at different levels of fertilization obtained at spring marshland in the years 2016-2017

| Year | | Protein (%) | | Starch (%) | |
|--------------------|------------------|-------------|-------|------------|-------|
| Fertilisation Dose | | 2016 | 2017 | 2016 | 2017 |
| P ₀ | N ₀ | 8.66 | 8.44 | 57.56 | 53.75 |
| | N ₃₀ | 9.30 | 8.38 | 57.53 | 54.24 |
| | N ₆₀ | 10.04 | 9.26 | 54.34 | 55.42 |
| | N ₉₀ | 11.68 | 10.47 | 55.15 | 53.63 |
| | N ₁₂₀ | 12.34 | 10.96 | 53.75 | 56.65 |
| P ₄₀ | N ₀ | 8.81 | 8.52 | 55.60 | 55.11 |
| | N ₃₀ | 8.86 | 8.25 | 56.29 | 54.63 |
| | N ₆₀ | 10.34 | 8.95 | 56.83 | 54.16 |
| | N ₉₀ | 11.58 | 9.98 | 56.18 | 56.01 |
| | N ₁₂₀ | 12.94 | 11.53 | 54.83 | 55.77 |

| | | | | | |
|------------------|------------------|-------|-------|-------|-------|
| P ₈₀ | N ₀ | 8.85 | 8.22 | 57.31 | 56.85 |
| | N ₃₀ | 9.09 | 8.38 | 56.79 | 56.24 |
| | N ₆₀ | 9.77 | 8.91 | 57.75 | 56.76 |
| | N ₉₀ | 11.36 | 10.51 | 54.25 | 55.93 |
| | N ₁₂₀ | 12.90 | 11.23 | 55.86 | 56.31 |
| P ₁₂₀ | N ₀ | 8.94 | 8.33 | 57.39 | 56.49 |
| | N ₃₀ | 8.93 | 8.19 | 57.49 | 57.20 |
| | N ₆₀ | 9.33 | 8.73 | 57.83 | 57.98 |
| | N ₉₀ | 11.29 | 11.10 | 54.92 | 55.92 |
| | N ₁₂₀ | 11.83 | 12.22 | 56.51 | 57.73 |
| P ₁₆₀ | N ₀ | 8.70 | 8.21 | 59.53 | 57.25 |
| | N ₃₀ | 9.87 | 8.39 | 58.58 | 57.57 |
| | N ₆₀ | 9.74 | 8.89 | 57.85 | 57.21 |
| | N ₉₀ | 11.25 | 10.83 | 57.10 | 57.47 |
| | N ₁₂₀ | 12.99 | 12.22 | 56.70 | 57.01 |
| DL (p 5%) | | 0.82 | | 2.84 | |
| DL (p 1%) | | 1.09 | | 3.76 | |
| DL (p 0.1%) | | 1.41 | | 4.96 | |

CONCLUSIONS

Recent changes in the climate require reconsideration of this crop, and in the years 2016 and 2017 there have been very favorable conditions in the Transylvanian Plain for obtaining high yields for the brewing of beer.

The largest outputs were obtained on agrofond N₉₀P₈₀, in 2016, the agrofond which is the most balanced in terms of nitrogen: phosphorus.

From the point of view of requirements for beer production, the most favorable agrofond was N₆₀P₈₀, - obtained between 8.91-9.77% protein and 56.76-57.75% starch.

BIBLIOGRAPHY

- 1.eac, Valeria, M. Ignea, Maria Ștefănescu,(2017). *Results of the research work performed at ARDS TURDA in the direction of rational use of fertilizers in long –term experiences*. Vol omagial 60 ani SCDA Turda
- 2.gnea M., (2017). *Year 2016, the rainy year of the last 60 years in Turda* Buletin informativ nr.24, Agricultura Transilvania, SCDA Turda..
- 3.aior C.L., (2005). *Contributions to Barley Cultivation Technology in the West of the Country, with a view to obtaining economically efficient yields with superior quality indices*. Ph.D. thesis, U.S.A.M.V. of Banat, Timisoara.