

THE EFFECT OF MANAGEMENT PRACTICES ON THE QUALITY OF WHEAT AND MAIZE HARVEST

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Abstract. *The researches were performed during the 2009 – 2012, in the experimental field of NARDI Fundulea and aimed to study the influence of agrotechnical practices on the quality of wheat and maize. The paper presents the results obtained in long term experiences with fertilizers and rotations at wheat and maize, under non-irrigation condition. The quality of yield is directly influenced by the fertilizers quantity and crop rotation. The protein content increases with the nitrogen rate applied and less with phosphorus rate, but together (NP) have a significant effect for both wheat and maize. This percentage varied between 9.0 - 15.4% for wheat and 5.5-9.4% for maize depending on crop year.*

Key words: crop rotation, fertilization, yield quality, wheat, maize

Introduction

In terms of agriculture modernization required knowledge and management factors that influence product quality. An important role of the environment and agro-technical measures that the background genetic characteristics of varieties or hybrids contribute to changes in quality parameters. Improving the quality of crops is subject to particularly fertilizer, which is an important technological component of the feed requirements of the plant [1, 2, 3, 4], and a location of crops [5, 6, 7, 8].

This paper aimed to estimate the quality of crop rotation and fertilization on yield of wheat and maize crops.

Material și methods

The research was conducted in NARDI Fundulea on the cambic chernozem soil, without irrigation, in a stationary experience established in 1967. Experimental variants studied are: wheat and maize monoculture, two-year rotation (wheat - maize), three-year rotation (wheat - corn - peas) and four-year

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rotation (wheat - maize - sunflower - peas) . During these rotations, the following method was applied fertilized (NOP0), fertilized with nitrogen at a dose of 90 kg / ha (N90P0), phosphorus fertilization at 75 kg / ha (NOP75), nitrogen and phosphorus fertilization dose of N90 kg / ha + 75 kg P₂O₅/ha (N90P75) and fertilization with manure administered annually (fall) in the dose of 20 t / ha (Gg 20 t / ha).

In the experiment we have complied with all technological links and quality measurements were performed with INFRATEC 1225 Grain Analyzer analyzer.

Climatic conditions

Changing the climate conditions during the experiments reveal variations in temperature and precipitation (Figure 1), with direct implications on the quality of the harvest.

The climatic conditions in 2008/2009 were characterized as unfavorable crop. From September to May, the amount of rainfall was below average multiannual this temperature deficiency associated with dry printing character in the first half. Rainfall of 528.9 mm (compared to the annual average of 475.6 mm), recorded in January-October, is given by the large quantities of water fallen during June, July and October, which represented 52% of the total. In the regard to the thermal regime, the values recorded shows that average monthly temperatures were higher (12.4 0C) than the annual average (11.30C).

In the agricultural year 2009/2010, the average temperature was about one degree Celsius above normal except January and February were colder (-1.5 and -0.6 ° C or below normal). Maximum deviations from normal were recorded (3.4 ° C) in August. The temperature over the annual average fall in the warming trend shown in recent years. In the regard to of precipitation, maximum positive difference (+ 47mm) was recorded in July and the highest decrease to normal was recorded in summer months.

In the agricultural year 2010/2011, monthly average temperatures were above the annual average (in 6 months), positive growth was recorded in November 2010 (+5.7 ° C), March and June 2011. The winter months were colder than the annual average of 0.3 to 0.8 ° C. Regarding rainfall, autumn 2010 was dry, with rainfall in November was -34 mm below the annual average. Improved water balance in the winter months (+36 mm over the multiannual average). In March-April, rainfall was below the annual average of -12 mm per month.

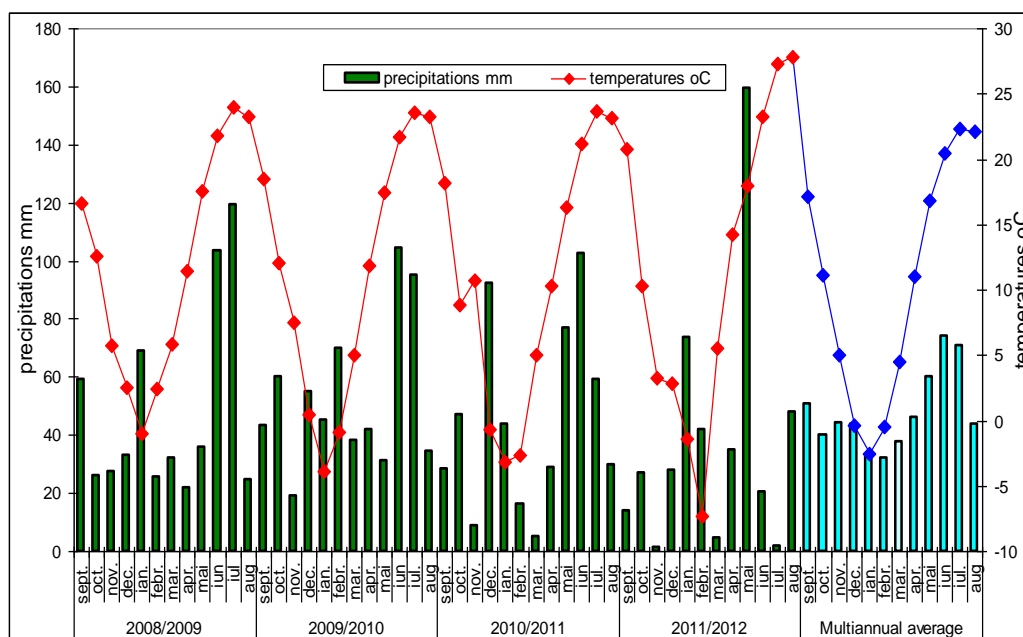


Fig. 1 – Evoluția precipitațiilor și a temperaturii, în perioada 2009-2012, la Fundulea
The evolution of the rainfalls and air temperatures, during 2009-2012, at Fundulea

The meteorological evolution in agricultural year 2011/2012 was characterized as unfavorable crop, with variations in rainfall associated with a diet high heat. Thus, in January and precipitation were recorded 40.5 mm and 99.5 mm more than the annual average, and in March, June and July there were 33.2 mm, 53.3 mm or 69.0 mm below the annual average being considered dry. These variations in rainfall associated with high temperatures have printed character of agricultural drought.

Rezultate obținute

The protein content of the wheat grain, recorded the higher values in 2012, compared to previous years crop. The highest values were obtained agrofunds N90P0 and N90P75 of rotations of 3 years (14.5% and 14.4%) and 4 years (14.0% and 14.4%).

In 2011 were recorded satisfactory values between 13.1% and 13.4%, this small variation is determined by climatic conditions and genetic characteristics of the variety (Figure 2).

Among the factors studied, the application of nitrogen fertilizers has a positive influence on the protein content of the grain.

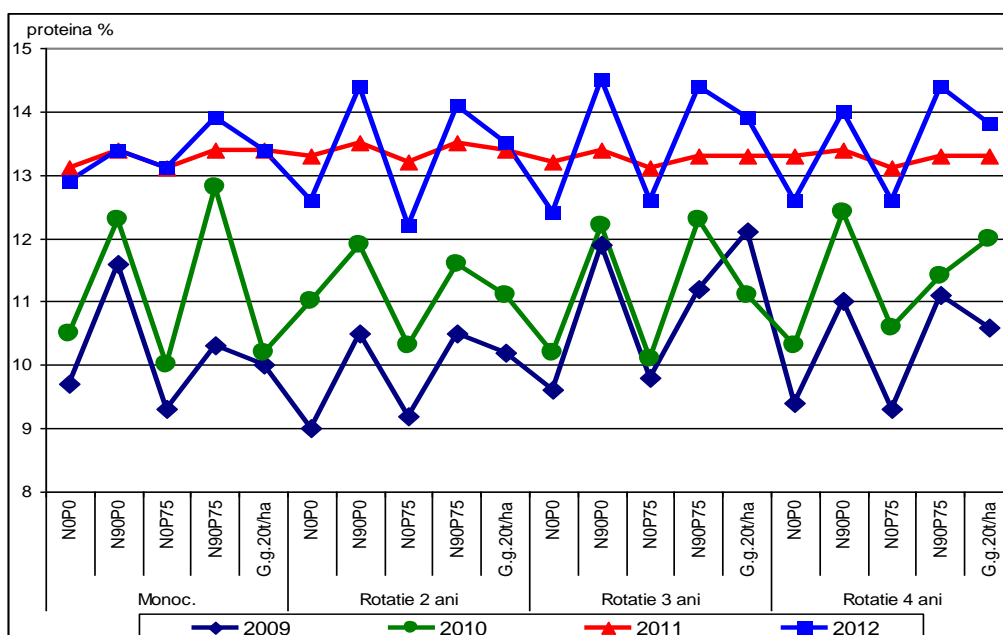


Fig. 2 Influența rotației și a fertilizării asupra conținutului de proteină la grâu
Influence of rotation and fertilization on wheat protein content

Among existing functions in the Windows - linear, logarithmic, polynomial, power and exponential - polynomial function recorded the highest regression coefficient for the relationship between agro-technical measures (rotation / fertilization) and protein content in wheat (Figure 3).

Increasing the number of years in the rotation and the application of nitrogen and phosphorus fertilizer in economic effective dose (ie N90P0 or N90P75) provides as highly significant positive correlations with regression coefficients ranging between 0.54 and 0.96.

The practice of monoculture associated with the lack of chemical fertilizers or organic, yielded a small amount of protein and the regression coefficient is 0.63.

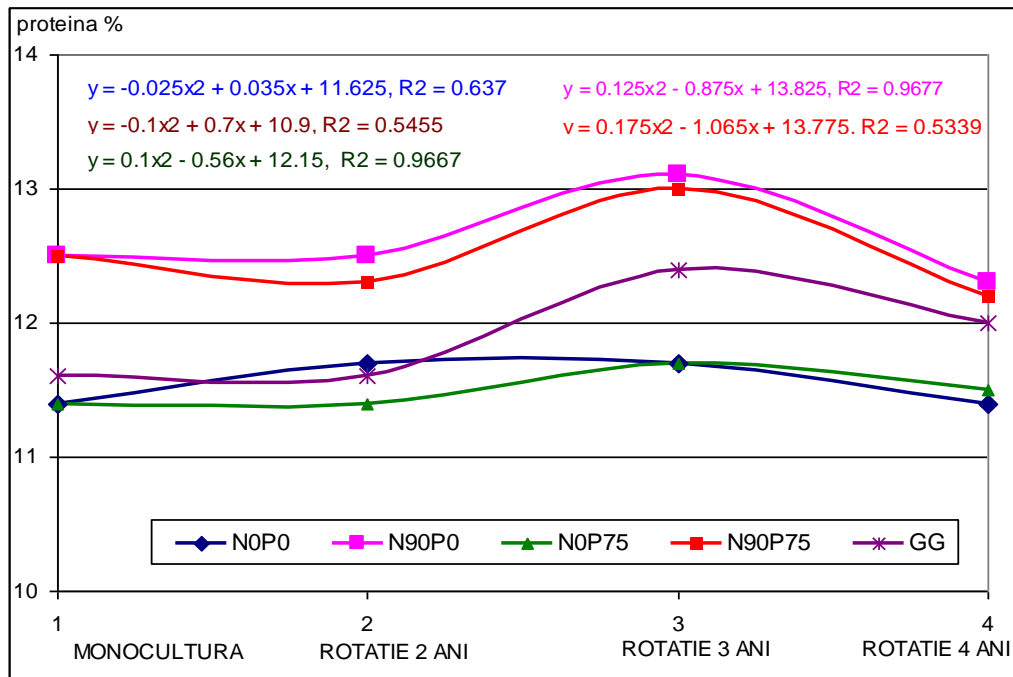


Fig. 3 Corelația dintre măsurile agrotehnice și conținutul de proteină la grâu
Correlation between agronomic measures and wheat protein content

For maize, the average data show that the percentage of grain protein, is dependent on nitrogen dose administered (Figure 4). Thus, the application of dose N90P0 or in combination with phosphorus N90P75 has added to 2.0-2.2% compared to the unfertilized control. Manure application resulted the protein values higher than or equal with variant N90P75 regardless of rotation.

The protein content of seeds recorded the highest values, in the rotation of 3 to 4 years, to the monoculture, due to a better use of nitrogen fertilizers or by the presence of leguminous plants in the rotation.

The protein content in 2012 varied little with values between 7.7-8.5%, regardless of rotation or fertilization. The highest values are obtained by applying the manure (8.5%).

The data obtained show that the percentage of raw protein in grain is higher in the less rainy years, manifesting the full influence of hybrid and fertilization. In 2009, they recorded the lowest values of protein (5.5 - 7.6%).

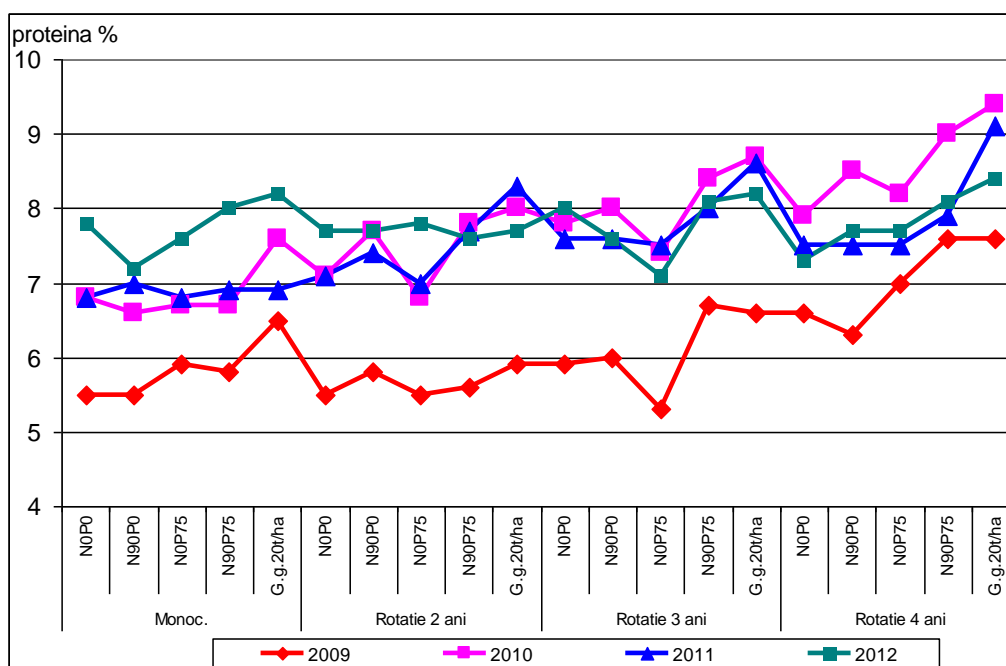


Fig. 4 Influența rotației și a fertilizării asupra conținutului de proteină la porumb
Influence of rotation and fertilization on maize protein content

The influence of rotation and fertilization on maize fat content is visible in the dry climate or normal (Figure 5).

The highest values of fat content (4.1 - 4.5%) were obtained in 2011, and the lowest (3.5 - 4.0%) in 2010. Compliance the rotations of 3 and 4 years with N90P75 agrofond or manure brought high gains compared to monoculture and fertilized.

Figure 6 shows the influence of agro-technical measures on the percentage of starch for maize. The lowest values of starch content were recorded in 2009, considered dry, below the 60.0% of the content of the grain.

The year 2012 achieved the highest starch content of between 73-75% compared to previous years, especially with application the fertilizers with nitrogen and phosphorus - N90P75 - or manure 20 t / ha. These high values of the levels of starch gives the qualitative needed to use corn as raw material in starch industry.

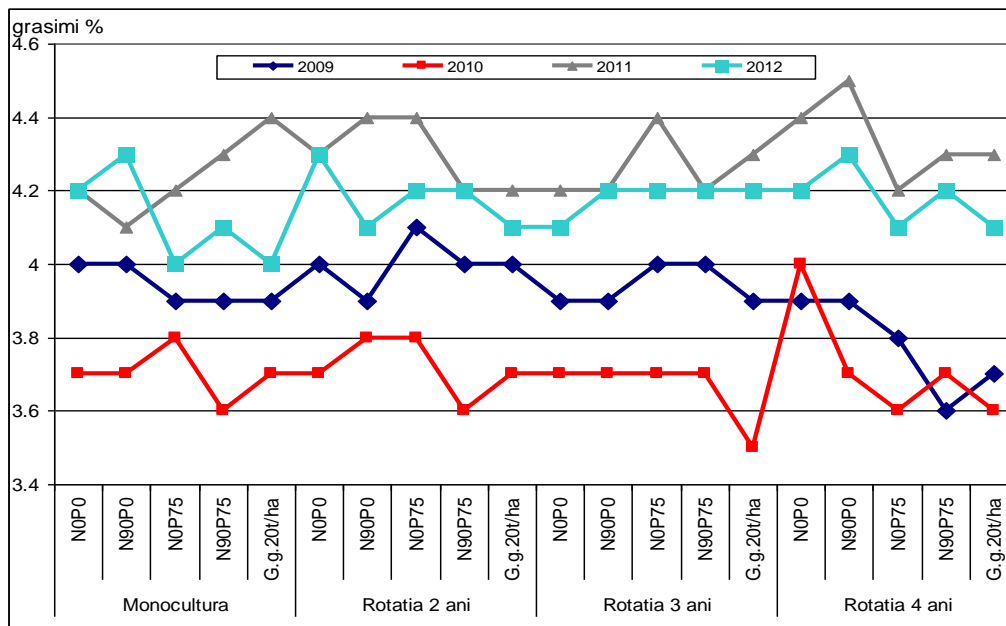


Fig. 5 Influența rotației și a fertilizării asupra conținutului de grăsimi la porumb
Influence of rotation and fertilization on maize fat content

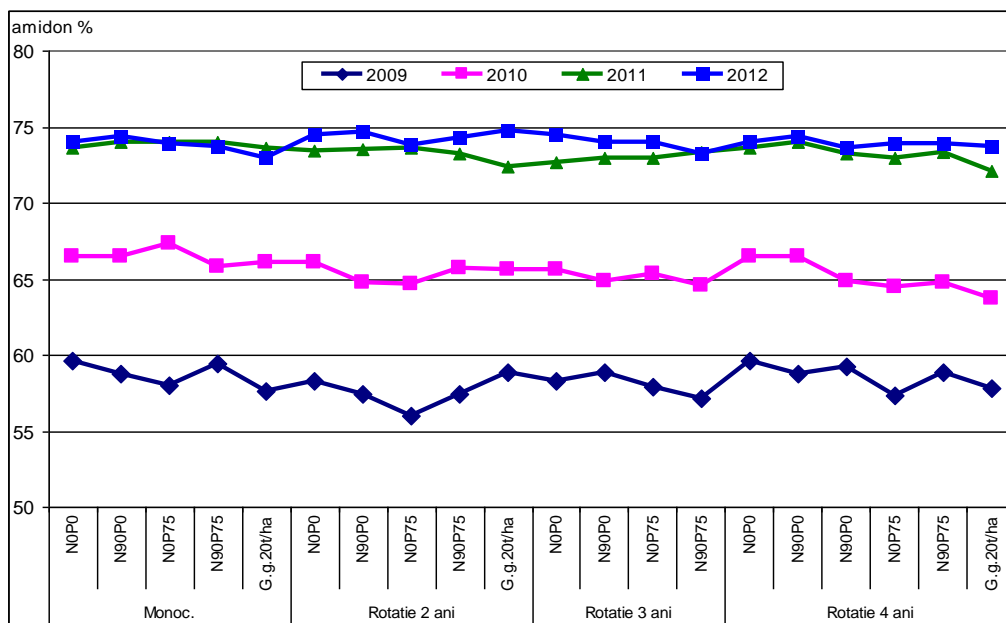


Fig. 6 Influența rotației și a fertilizării asupra conținutului de amidon la porumb
Influence of rotation and fertilization on maize starch content

Conclusions

- The quality of the crop is varied from one year to another, both wheat and maize by crop rotation and chemical and biological fertilization, as well as weather conditions.

- Protein content in wheat groups such variants: high quality (protein > 13%), good (12-13%) and satisfactory (8-12%). Thus, application of fertilization with N90P75 or N90P0 and rotation with 3 or 4 years, increased protein content values of 12 -14% compared with unfertilized control witness and monoculture.

- For corn, rotation of 3 or 4 years and applying fertilizers with N90P75 or N90P0 leading to high values, as an average over the entire period of 5.9-9.8 % for protein, 3.9-4.5 % for fat and 60.0-75.0 % at starch.

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