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ANALYSIS OF THE INFLUENCE OF GENOTYPE, SOIL TYPE AND CROP YEAR FACTORS ON THE PRODUCTION AND QUALITY OF THE SPRING BARLEY HARVEST

AXINTI NICOLETA, RÎŞNOVEANU LUXIŢA

Keywords: spring barley, yield, quality indices

ABSTRACT

This paper proposes an analysis of the influence of genotype, soil type, crop year and the interaction between these factors on the yield and on the main quality indices of spring barley. The research was conducted on four spring barley varieties (Annabell, Thuringia, Cristalia and Tunika) grown on two soil types (typical chernozem and calcaric aluviosoil) in the Vădeni area, Brăila County, in 2008-2010.

INTRODUCTION

The quality of barley as raw material for the malt and beer industry is determined by genetic (variety of barley) and pedoclimatic (weather, soil) factors and by elements regarding the growing technology, such as: crop rotation, fertilization, soil works, and the phitotechnical and technological elements of sowing, maintaining and harvesting of this species.

Knowing the contribution of genotype and environmental conditions (soil conditions and weather conditions), and especially the contribution of interactions between these factors in achieving quantitative phenotypic traits, is of particular importance for finding the most valuable varieties of barley that can be grown in a certain geographic area (1).

MATERIAL AND METHOD

The research was conducted between 2008-2010 in Vadeni area, Braila county, on four varieties of spring barley (Annabell, Thuringia, Cristalia and Tunika) grown on two different soil types (typical chernozem and calcaric aluviosoil).

Following to the specific objectives of this paper, we studied the influence of the pedological factor (soil type), the genotype factor (variety) and the climatic conditions, and also the interactions between the three studied factors on the yield and quality indices of the grains of spring barley.

To illustrate suggestively the complex influence of the studied factors and of their interactions on the production and the analyzed quality indices, we performed with the help of variance analysis (3), an estimate of the percentage share of each element involved in the making of the phenotypic expression of a certain attribute.

RESULTS AND DISCUSSIONS

The analysis of the variance permitted the establishment of the percentage share of the three studied factors (soil type, variety, crop year) and their interactions in regard to the yield and the main quality indices of the spring barley grown in Vadeni area, Braila county, in 2008-2010.

The participation quotient of the soil conditions, has influenced in a similar proportion the assortment (16%) (figure 2), the hectolitric mass (19%) (figure 4) and the starch content (17%) (figure 5) and in a higher proportion the protein content (23%) (figure 6), the mass of 1000 grains (MMB) (25%) (figure 3) and the yield (38%) (figure 1).

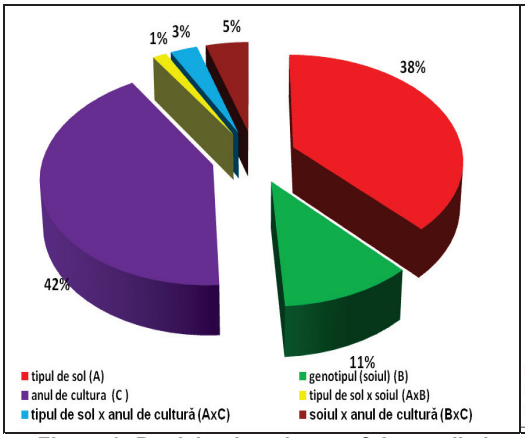

Figure 1. ***Participation shares of the studied factors and the interaction between them in regard to the yield***

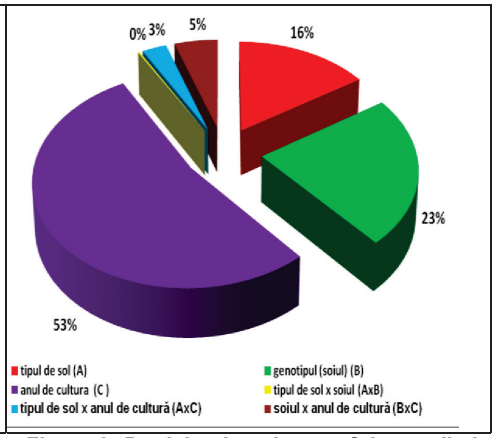

Figure 2. ***Participation shares of the studied factors and the interaction between them in regard to the assortment***

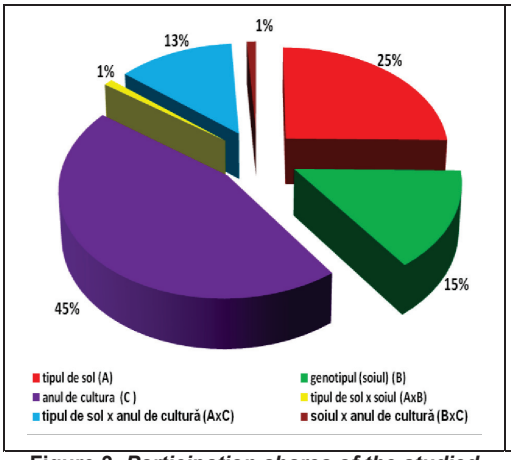

Figure 3. ***Participation shares of the studied factors and the interaction between them in regard to the MMB***

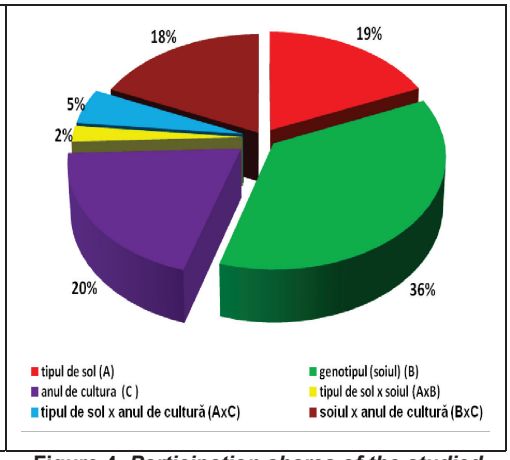

Figure 4. ***Participation shares of the studied factors and the interaction between them in regard to the hectolitric mass (MH)***

The participation share of the *climatic conditions* in the three experimental years is very high in the case of humidity (57%) (figure 7), assortment (53%) (figure 2), the mass of 1000 grains (45%) (figure 3) and the yield (42%) (figure 1) and only 2% in the case of protein content and germination capacity (figures 6 and 8).

The interaction between soil type and crop year had an important influence share on the starch content (43%) (figure 5), humidity (35%) (figure 7), germination capacity (18%) (figure 8) and mass of 1000 grains (13%) (figure 3). In terms of the influence of the other interactions of the studied factors, it is observed that these have a low participation share (1-7%).

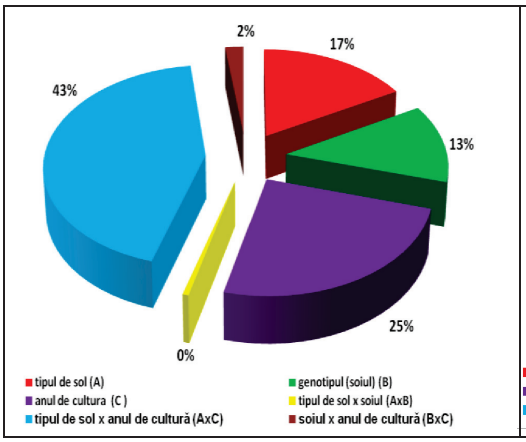

Figure 5. ***Participation shares of the studied factors and the interaction between them in regard to the starch content***

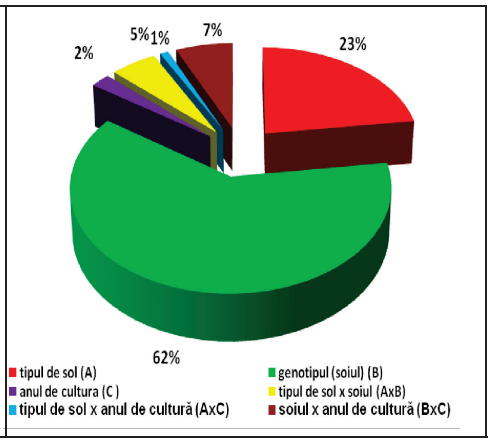

Figure 6. ***Participation shares of the studied factors and the interaction between them in regard to the protein content***

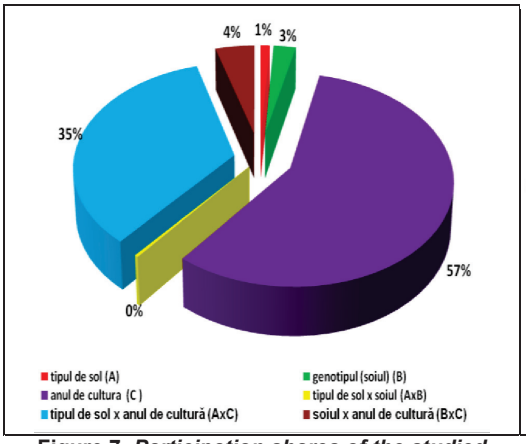

Figure 7. ***Participation shares of the studied factors and the interaction between them in regard to the humidity***

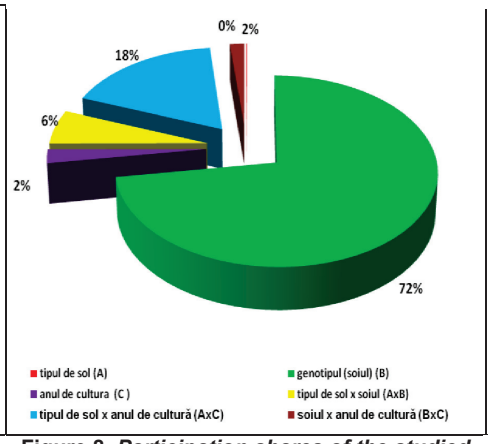

Figure 8. ***Participation shares of the studied factors and the interaction between them in regard to the germination capacity***

CONCLUSIONS

1. The yield is influenced the most by the weather conditions of the crop year.
2. The assortment was influenced the most by the weather conditions.
3. The mass of 1000 grains was influenced, in the highest proportion, by the weather conditions.
4. The hectolitric mass was mostly influenced by the genotype factor (variety).
5. The starch content was mostly influenced by the interaction between soil type and crop year.
6. The protein contents was influenced, in the highest proportion, by the genotype factor (variety).
7. The humidity was influenced the most by the weather conditions.
8. The germination was influenced, in the highest proportion by the variety.
9. Very important in the case of this research is the striking influence on the yield and yield quality of the weather conditions, followed by the soil and soil type respectively.

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STUDY REGARDING THE ESTABLISHMENT OF THE RELATIONSHIPS BETWEEN THE MAIN QUALITY INDICES OF SPRING BARLEY

AXINTI NICOLETA, CIOROMELE GABRIELA ALINA

Keywords: spring barley, yield, quality indices

ABSTRACT

This paper aims to give an analysis regarding the establishment of the relationships between the main quality indices of spring barley. The research was conducted on four spring barley varieties (Annabell, Thuringia, Cristalia and Tunika) grown on two types of soil (typical chernozem and calcaric aluviosoil) in the Vădeni area, Brăila County, in 2008-2010.

INTRODUCTION

Barley can be used for multiple purposes: as human food, as animal food and in the industry (as raw material in the making of beer and in the industry of alcohol, dextrin, glucose, etc.) (1,2,3). The actual quality of barley and spring barley is a result of the interaction between sorl, growing technology and environmental conditions (4).

MATERIAL AND METHOD

The research was conducted between 2008 and 2010 in Vădeni area, Brăila county, on four varieties of spring barley (Annabell, Thuringia, Cristalia and Tunika) grown on two different soil types (typical chernozem and calcaric aluviosoil). For the analysis of the association degree of the studied quality indices on the four spring barley varieties (Annabell, Thuringia, Cristalia and Tunika) we performed the calculation of the correlation quotient (r) and the regression analysis for the most important attributes (5).

RESULTS AND DISCUSSIONS

The results regarding the *correlation quotients* between the quality indices that were studied on the four spring barley varieties grown in Vadeni area, Braila county, in 2008-2010 are presented in table 1.

As it can be observed, the obtained correlation quotients show the existance of strong and significant links between the studied quality indices.

Table 1

The correlation quotients between the quality indices of the spring barley varieties grown on two different soil types in the weather conditions of 2008-2010.

Indici	MMB (g)	MH (kg/hl)	Assortment (%)	Protein (% s.u.)	Starch content (% s.u)	Humidity (%)	Germination (%)
MMB (g)	1						
MH (kg/hl)	0,645**	1					
Assortment (%)	0.911***	0,638**	1				
Protein (% s.u.)	-0,302	-0,693***	-0,311	1			
Starch content (% s.u)	0,859***	0.775***	0,837***	-0,466*	1		
Humidity (%)	0,583**	0,455*	0,440*	-0,169	0,428*	1	
Germination (%)	0,367	0,699***	0,351	-0,486*	0,571**		1

$r_{5\%} = 0,40$ $r_{1\%} = 0,52$

The analysis of the results in table 1 shows that the mass of 1000 grains (MMB) is positively correlated with the hectolitric mass (r = 0.645***), the assortment (r = 0.911***), the starch content (r = 0.859***) and the humidity (r=0.583**). The hectolitric mass is positively correlated with the starch content in the first place (r = 0.775***) and then with the assortment (r=0.638**) and the germination (r = 0.699***). Likewise, the assortment was positively correlated with the humidity (r = 0.440*) and the starch content (r = 0.837***). A positive correlation that was statistically significant was also obtained between the starch content and germination. From the registered negative correlations, the following stand out: between the protein content and hectolitric mass (r = 0.693***) and the starch contents (r = -0.466), protein and germination (r = -0.486*).

For a more precise examination of the correlations that were found between the quality indices of the studied varieties, we performed the regression analysis for the most important attributes.

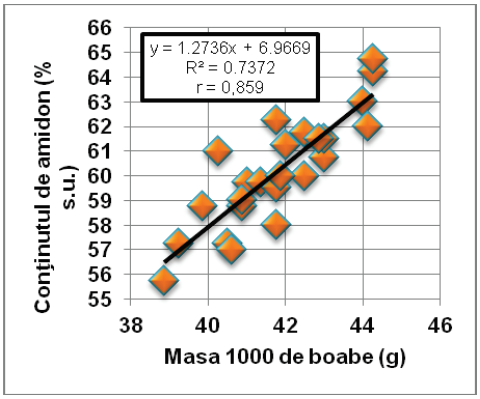

Figure 1. Relationship between the mass of 1000 grains and starch content

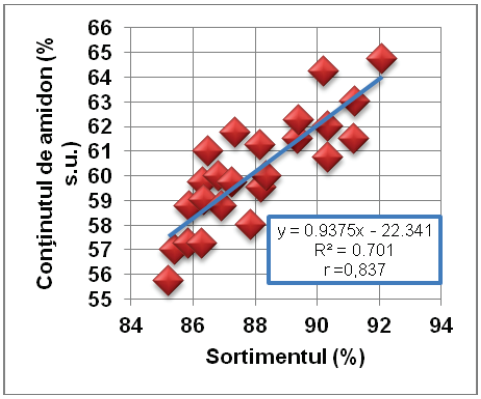

Figure 2. Relationship between assortment and starch content

The relationship between the starch content and the mass of 1000 grains is presented in figure 1. The correlation quotient with the value r = 0.859, indicates the existance of a significantly possitive relationship between the two quality indices. This relatioship is described by a regression line with an ascendent slope (b =1.22), which shows that there is a strog relationship between the starch content and the mass of 1000 grains. The determination quotient (R^2 = 0.7029) shows that in the case of the four studied genotypes, the variation of starch contents happens, in proportion of 70%, due to the variation of the mass of 1000 grains.

Figure 2 shows the relationship between the starch contents and assortment. The correlation quotient with the value r = 0.837 indicates the existance of a very significant positive relationship. This is also confirmed by the configuration of the points cloud from the graphic representation. The relationship between these qualitative parameters is described by a regression line with an ascendent slope (b = 0.94), which shows the fact that there is a link between these indices. The determination quotient (R^2 = 0.701) indicates that, in the case of the four studied varieties, 70% of the starch content variatien can be attributed to the variation of the assortment.

Between the starch content and the hectolitric mass there is a relationship described by a regression line with an ascending slope (b = 0.80), which shows that the starch content of spring barley grains for the studied varieties is directly proportional with the hectolitric mass (figure 3). The correlation quotient between the starch content and the