THE INFLUENCE OF CROP ROTATION, FERTILISATION LEVEL AND PHENOPHASE ON THE PARTICIPATION WEIGHT OF WHEAT COMPONENTS (ROOT SYSTEM, STEM, BLADES AND SPIKE) AT TOTAL PHYTOMASS REALISATION ON BROWN LUVIC SOILS IN THE WESTERN PLAIN OF ROMANIA

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Abstract. The growth of the winter wheat is characterized by an increase in the volume and weight of the whole plant: roots, stem, blades and spike. Every component displaying a particular response to the influence of environmental factors, having a particular developmental rhythm function of it's own characteristics.

The knowledge of the plants'growth dynamics accepts the intervention in a certain moments of the agrotechnical factors (fertilization, sowing period, density, forerunner plant) in order to provide high and stable production. The dynamics of the phenomena in relation with growth of the winter wheat made the object of this research.

Keyword: winter heat, crop rotation, fertilization level, phenophase, phytomass wheat components, forerunner plant.

INTRODUCTION

Most of the reserches were centred on the influence of crop rotation on the yields, namely on the phytomass accumulation. The crop rotations with regard to wheat was very satisfactory in this order as forerunner plant: pea, beans, winter rape, bots, linseed, soja, red clover, potato, sugar beet, sunflower, corn, etc. [5].

Bîlteanu (1993) [3], after long tests demonstrated the importance of crop rotation on wheat yields on brown-red soils in Romanian Plain. On clay-illuvial podzols, the introduction of ameliorative plants such as red clover represented an element of outmost importance for increase of the wheat yield.

Dincă (1982) [4], made some references on the role of crop rotation on wheat yield and on the organic accumulation in whole plant and grains.

It is demonstrated that after 10-year monoculture, wheat yield decreases continously in comparative with rotations. It fluctuates as a consequence of changing climatic conditions. Under such circumstances, fertilization does not induce a significant yield increase. A particularly important problem is linked to wheat crop increment, which must fit the rising consumption needs of world population [2, 6].

Advances in biomass accumulation dynamics in winter wheat in the pedo-climatic conditions of Western Plain of Romania were made by [8] during their studies on Transsylvanian wheat race.

The influence of each factor on dry biomass accumulation in wheat shows that crop rotation and fertilization determines essential differences in the accumulation of dry phytomass [9].

The influence of fertilization on biomass accumulation in winter wheat was studied. Frequent researches put in a direct relationship the pytomass accumulation with the fertilizers that was utilized [1].

The dynamics of the phenomena dealing with winter wheat growth made the object of feud researches [7].

MATERIALS AND METHODS

Multifactorials experiments (subdivided plats) were set up in the period 2005-2007 at Agricultural Research and Development Center (A.R.D.C) Oradea (Romania), on soils characterised by temporary excess of humidity as brown luvic soils. The experiments are having in view the determination of total phytomass in relation with phenophase, forerunner plant and fertilization level.

The experimental design was polyfactorial in subdivides stands using as factors interaction: forerunner plant, agrofund and phenophase. The *Delia* race of wheat as biological material was employed.

Total phytomass and separately every plants parts were weighted in the laboratory. The results were analysed with ANOVA (analysis of variance). The phytomass was expressed as dry weight/10 plants.

RESULTS

In the following we present the results of the experiments concerning the total dry phytomass of wheat monoculture accumulation on unfertilised brown luvic soils (N_0P_0) (Fig. 1), on brown luvic soils fertilised with organo-mineral complex ($N_{100}P_{80}$ + 10 t/ha manure) (Fig. 2), also, the total dry phytomass accumulation of wheat cultivated after corn (G-P) on unfertilised brown luvic soils (N_0P_0) (Fig. 3), on brown luvic soils fertilised with organo-mineral complex ($N_{100}P_{80}$ + 10 t/ha manure) (Fig. 4), and total dry phytomass accumulation of wheat cultivated after pea (M-G-P-P) on unfertilised brown luvic soils (N_0P_0) (Fig. 5) and, finally, on brown luvic soils fertilised with organo-mineral complex ($N_{100}P_{80}$ + 10 t/ha manure) (Fig. 6).

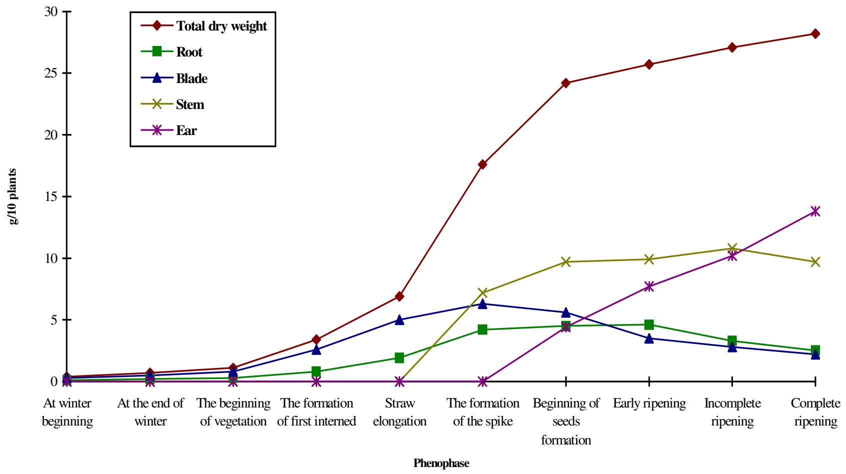

Figure 1. Dynamics of total dry phytomass accumulation. Contribution of the weight of root, blade, stem and spike in the total dry phytomass of wheat monoculture on unfertilised brown luvic soils (N_0P_0) (Oradea, Romania, 2005-2007)

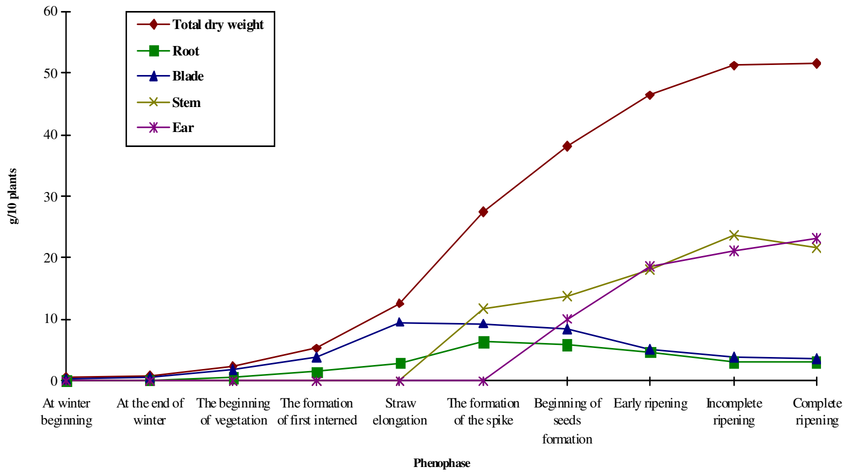

Figure 2. Dynamics of total dry phytomass accumulation. Contribution of the weight of root, blade, stem and spike in the total dry phytomass of wheat monoculture on brown luvic soils fertilised with organo-mineral complex ($N_{100}P_{80}$ + 10 t/ha manure) (Oradea, Romania, 2005-2007)

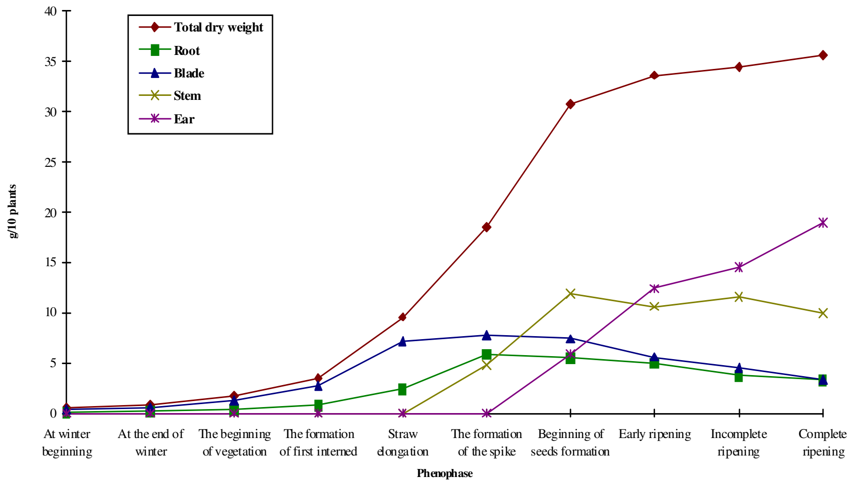

Figure 3. Dynamics of total dry phyitomass accumulation. Contribution of the weight of root, blade, stem and spike in the total dry phytomass of wheat cultivated after corn (G-P) on unfertilised brown luvic soils (N_0P_0) (Oradea, Romania, 2005 - 2007)

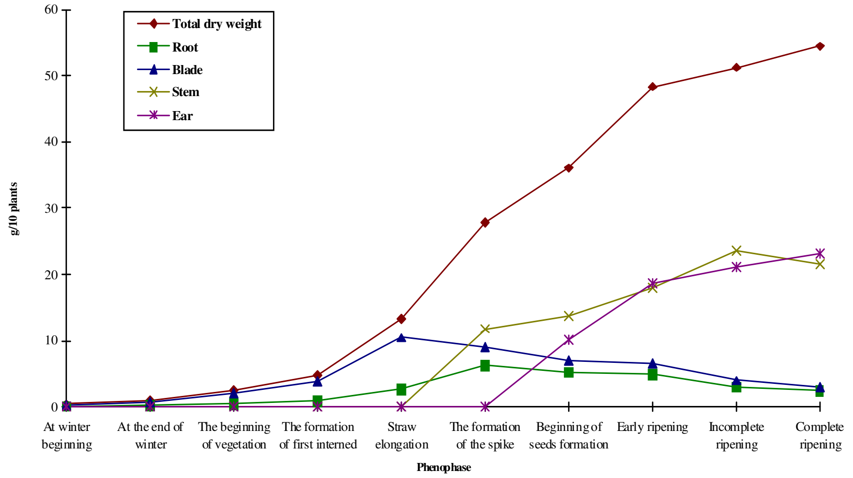

Figure 4. Dynamics of total dry phytomass accumulation. Contribution of the weight of root, blade, stem and spike in the total dry phytomass of wheat cultivated after corn (G-P) on brown luvic soils fertilised with organo-mineral complex ($N_{100}P_{80}$ + 10 t/ha manure (Oradea, Romania, 2005 - 2007)

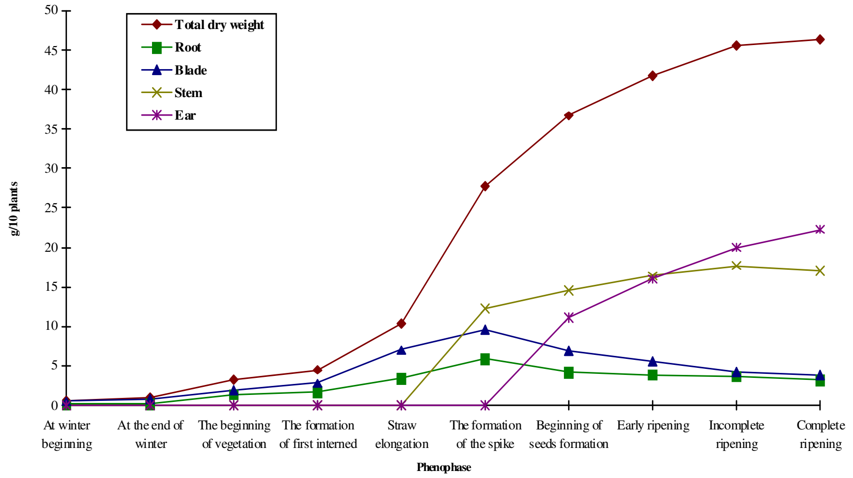

Figure 5. Dynamics of total dry phytomass accumulation. Contribution of the weight of root, blade, stem and spike in the total dry phytomass of wheat cultivated after pea (M-G-P-P) on unfertilised brown luvic soils (N_0P_0) (Oradea, Romania, 2005 - 2007)

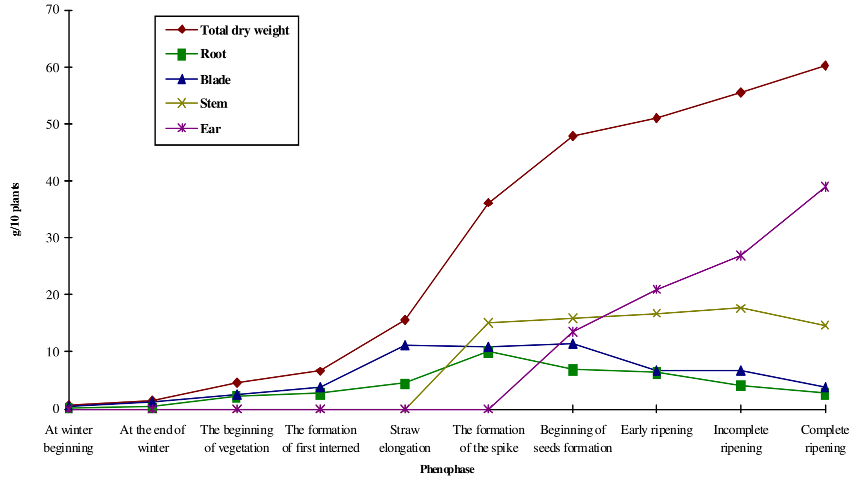

Figure 6. Dynamics of total dry phytomass accumulation. Contribution of the weight of root, blade, stem and spike in the total dry phytomass of wheat cultivated after pea (M-G-P-P-) on brown luvic soils fertilised with organo-mineral complex ($N_{100}P_{80}$ + 10 t/ha manure) (Oradea, Romania, 2005- 2007)

DISCUSSIONS

As a succession of the analysis that we made, the registered and presented values on Fig. 1-6, we can assert the following:

- a positive correlation exists between the phenophase and total plant phytomass accumulation regardless of the forerunner plant.
- the maximal values of total plant phytomass accumulation were found in both fertilised and unfertilised alternatives (mineral and organo-mineral fertilisers) corresponding to the formation of spike phase depending also on the quality of the forerunner plant (best alternative-pea).

Concerning the contribution of plants' components (roots, stem, blade, spike) at total plant phytomass, it is a function of each component. Thus, in what regards the root, the forerunner plant influenced the weight of participation which reached the highest values in wheat monoculture (at the formation of the spike phase, 20-40%).

For the rest of the forerunner plants utilised for wheat participation weight was identical with the monoculture, the participation percentage being superior and varying between 23-33%.

If the fertilisation level modified the values of the contribution of the weight of the root at the total plant phytomass (weight that was higher in the case of the monoculture), the corresponding phenophase was the formation of the spike, being identical with the monoculture.

At the last phenophase, late ripening (complete maturation), the participation of the weight of the root at the total plant phytomass was much lower, varying between 7-9%. Low values were obtained in the alternative of wheat cultivation after pea as a forerunner plant (7%).

The blade participated in a different way at the edification of the plant phytomass, even from the beginning: the formation of first internode phase to elongation of the straw phase. In the case of monoculture or with corn as a forerunner plant, the blade's participant weight was of 77% in the first internode phase. After pea, in the straw elongation phase the participant weight was of 67-87%. This situation corresponds to unfertilised alternatives. After mineral or organo-mineral fertilization, the participant weight of blades in the same straw elongation phase, oscillated between 76-83% regardless of the forerunner plant. In the last phase of complete seed maturation, the blades' contribution to total phytomass was lower between 5-7% regardless of the forerunner plant and fertilisation level.

The stem participation at total biomass was high, especially in the last phenophase. A positive correlation between the forerunner plant, fertilisation level and the stem weight was established.

In the case of wheat monoculture, the stem contribution rose to 34% in unfertilised alternative. After pea as a forerunner plant, the stem contribution rose to 37% (crop rotation of 4 years).

As the fertilisation level increased from mineral to complex organo-mineral fertilisation, the stem weight was high regardless of the forerunner plant, but more accentuated in the case of wheat monoculture and after corn (39-42%). After pea the registrated values varied between 34-39%, in both cases taking in account the fertilization with mineral fertilizers.

The highest contribution in total phytomass was in the case of spike in the last phenophase regardless of the forerunner plant or fertilisation level when organo-mineral complex was utilized. A comparison with monoculture shows that participant weight of this is of 49%.

We consider that the present short presentation of the data illustrates the participation of all plant's components at the realisation of phytomass, the most of it belonging to stem and spike.

During the last phenophase, stem contributed substantially to total biomass accumulation being positively correlated to crop rotation plant and created agrofund.

Stem wheight of total phytomass raised proportionally to agrofund increment due to mineral and organo-mineral fertilization, regardless of crop rotation plant, being more accentuated in the case of wheat monoculture and after corn as crop rotation plant respectiely after pea fertilized with mineral fertilizers.

Main contribution to phytomass accumulation had ear during last phenophase, regardless of crop rotation plant and agrofund, crop rotation plant and mixed fertilization, as compared to wheat monoculture.

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