

## AGRONOMIC IMPACTS ON YIELD FORMATION OF WHEAT

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Crop growth and productivity are the results of complex physiological and biochemical processes. Grain yield depends on the interaction of these processes, each being controlled by genes and influenced by the environment. Nitrogen is one of the most important elements in the nutrition of higher plants and one of the most costly inputs in the production of winter wheat. It is second only to the precipitation as the most frequent yield limiting factor, and even when N is not a yield limiting factor, wheat is less than 50% efficient at utilizing applied N fertilizer.

Winter wheat requires nitrogen in different doses in the different phenophases. Its distribution is carried out in the form of a base fertilization and one or two, rarely more top-dressing. Generally speaking for the quality to manifest, more nitrogen is needed than the dose ensuring maximum yield.

### Materials and methods

Hungarian, French and Serbian winter wheat varieties: Martonvásári 21, Fatima-2, Alföld 90 Gaspard, Jarebica, Pobeda, Buzogány were sown into chernozem soil (calciustoll) at Hatvan-Nagyombos, (Middle Hungary), in the years of 1996-2003. Split-split plot design with four replications was used. The wheat varieties were planted in the row spacing of 12 cm at a rate of about five million live seeds/ha. Treatment plot size was 1 m wide and 10 m long. Ammonium nitrate fertilizer (36-0-0) was broadcast at a rate of 40, 80, 120, 40+40 and 80+40 kg ha<sup>-1</sup>. The single and the first rates were broadcast at the tillering, the second broadcast was after anthesis (Feekes 3 and Feekes 10.5.).

In the trial the quantity and baking quality of the yield was examined according to the current standards (MSZ ISO 5531; MSZ ISO 3093; MSZ 6369-6). The statistical evaluation of the results was done with one-factor variance analysis.

### Results and discussion

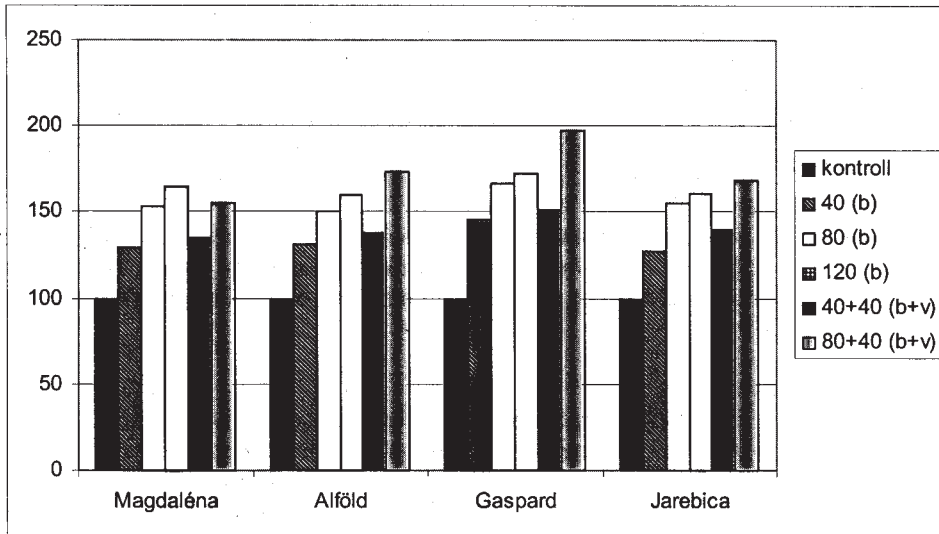
#### *1. Effect of top-dressing on yields*

Between 1996 and 1998 the yield of the Mv-21 and Alföld 90 cultivars was influenced mainly by precipitation, especially the amount of rainfall in April and May. In 1996, which was a very dry year, average yield was 2 tons less than in other years. In spite of this the result of top-dressing was less marked, but tendential yields increase was seen.

The yield results of the year 2000 were emphasized. Summarizing the results in Figure 1, it can be concluded, that among drought conditions nitrogen top-dressing has a great importance. (In Fig. 1. the different yields of the various years are shown as the % difference from the control yield.)

In the examined very dry 2001-2003 years even the 40 kg/ha dose resulted in a yield increase, which was not significant, but estimable. This rate was not enough, but higher doses – 80 és 120 kg ha<sup>-1</sup> – resulted significant yield increasing. The split 40+40 top-dressing resulted in similar yields. This means that the second top-dressings, at the time of flowering did not influence significantly the yields – in accordance with Hungarian and international experiences.

Figure 1.: The yield of the wheat between 2001 and 2003 in Nagygompos  
(the results are shown as the % difference from the control yield)  
(b) = tillering, (v) = flowering)



The 80 and 120 kg/ha nitrogen rate increased yields significantly. The increase in the case of 120 kg/ha was not exceedingly high, when compared to the 80 kg dose, therefore the cultivation and economical optimum of nitrogen top-dressing was around 80-100 kg/ha active agent among these conditions. In the 80 + 40 kg/ha division the second dose had no significant effect on the yield increase. This second top-dressing is applied in experiments and in the practice to improve baking quality, therefore this article also deals with the changes of quality elements and parameters in the Nagygompos trial.

## 2. Effect of top-dressing on yield quality

Summarizing the results of the treatments and the differences between the cultivars it can be said that the increasing rate of top-dressing and their division resulted in quality improvement even among the unfavourable ecological conditions of the trial. The same was seen in case of other cultivars and former trials, and international literature also confirm it.

As it is seen from the data showing yield results the 120 kg ha<sup>-1</sup> dose nitrogen top-dressing was less efficient from the viewpoint of yield. But from the viewpoint of protein and gluten content the changes were favourable, therefore the effectiveness of a higher fertilizer dose and the economically rewarding quality improvement has been proven. The division of top-dressing had a highly favourable effect, therefore the excess cost of the multi-spraying could be rewarding. In case of the weaker foreign cultivars the improvement was especially significant among drought conditions. As it is seen in the former, that data the drought period of the years after 2000 came after the introduction of