Contribution to the Study of the Impact of Phosphate Fertilizer on Biochemical Parameters of *Triticum durum*

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Abstract

In this study we are interested in assessing the impact of different regimes of NPK and its effect on wheat Triticum durum. The first results show that the presence of fertilizer causes a decrease in the percentage and speed of germination and an inhibition of growth of wheat. On the metabolic level, the NPK caused a significant increase in mean levels of proline and soluble sugars, and inhibition of protein synthesis.

Keywords: NPK, Proline, Protein, Soluble sugar, *Triticum durum*.

1. Introduction

Adequate fertilization is a prerequisite for modern agriculture in order to meet high yields and optimum quality of crops. The vast majority of mineral elements essential to plant development, is only necessary in minute amounts, which may be provided by most soils without supplements. However, some key elements that are phosphorus (P), potassium (K), sulfur (S) and nitrogen (N), are frequently in short supply in the soil to allow optimal growth of crops. Despite its abundance, atmospheric nitrogen is unusable for most plants. The only plants able to use nitrogen from the air are those that develop a symbiotic relationship with microorganisms in nodules on plant roots. Unlike phosphorus and potassium, plants need large amounts of nitrogen, nitrogen representing 3-4% of their dry matter. Moreover the efficiency of nitrogen fertilization on crop yields contributed to the development of modern agriculture more intensive nitrogen. In addition to heavy loads caused by this item of expenditure, the massive inflow of nitrogen fertilizers started in the middle of last century affects the natural nitrogen cycle, which is not without consequences for the environment and health.

The objective of this study is to evaluate the effects of NPK fertilizer nitrogen on physiological parameters, biochemical and metabolic ones on wheat *Triticum durum*.

2. Materials and methods

2.1. Biological material

The experimental material used in our work is wheat (Triticum durum) Geta come from hard JTGC (demonstration farm and seed production of Guelma).

2.2. Determination of soluble sugars:

The total soluble sugars were determined by the method of Burnett and Schield [2],

2.3. Determination of proline.

Proline is determined by the method of Monnoveux and Nemmar, [3].

3. Results

3.1. Effects of NPK on the physiological parameters of germination and growth

3.1.1. Effects on the germination percentages.

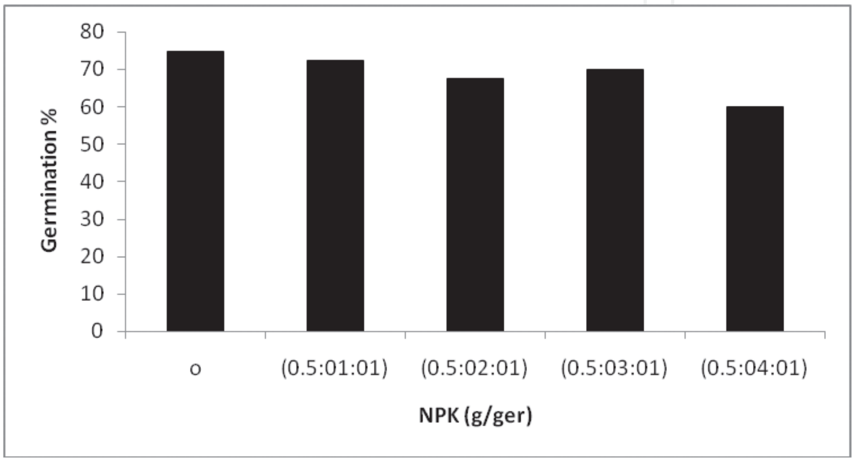

Figure 1. Effects of different regimes of NPK on the average rate of seed germination of wheat germination time = 96h. p = 0.031.

3.2. NPK effects on biochemical parameters of germination.

3.2.1. Effect of NPK on the average content of sugar

The results of treatment effects by the various regimes of NPK on average contents of total sugars in roots and leaves of wheat seeds are shown in Figures 2.

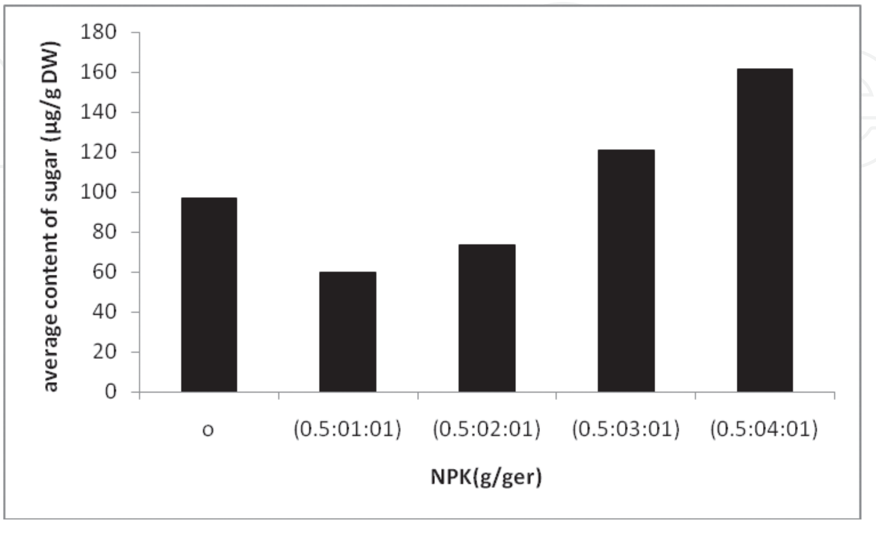

Figure 2

3.2.2. *Effect of NPK on the average content of proline:*

The results of the effects of treatment with NPK on the mean levels of proline are shown in Figure 3.

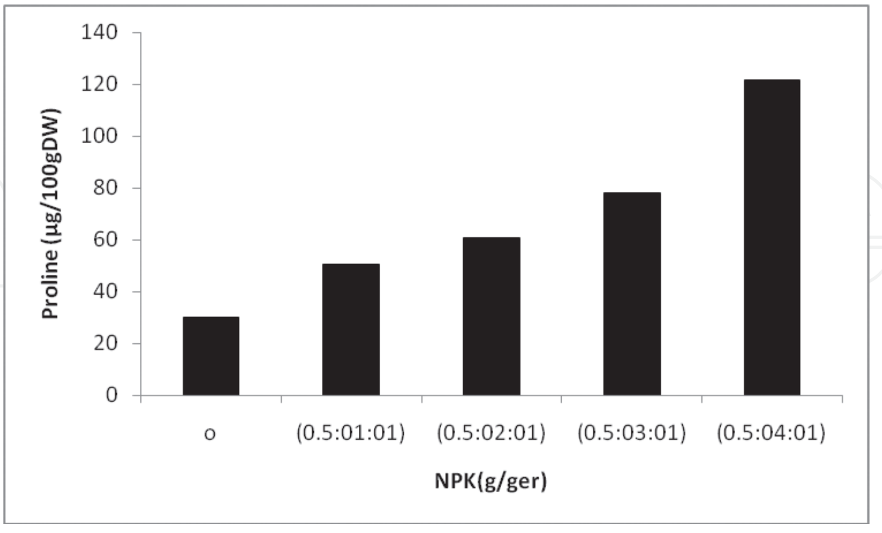

Figure 3. Effect of NPK on the average rate of proline roots from wheat seeds.

4. Discussion and Conclusion

In this section we determined the effects of NPK on germination percentage, there is a slight decrease in germination percentage especially in the plan (0.5:0.4:0.1) (20%). Our result is in perfect agreement with the work of **[4]** (Savoie and Smith, 1997) which showed that germination was reduced with increasing nitrogen.

This disturbance observed in wheat seeds is due to the effects of substances contained in the manure on the outbreak of various enzyme activities originally starting the germination process. The work of other authors **[5, 6]** as support the findings in our work.

In pea *Pisum sativum*, the nature reserve is mainly protein, up to 40% **[7]**. Firstly, it has been shown in *Medicago truncatula* (another legume) that a massive flow of nitrogen is released into the seed during germination. The high concentrations of nitrogen (as ammonium free) are toxic to cells that need to be cleared. The nitrogen is assimilated to form amino acids: this is detoxification.

Indeed, in a second step, it is also proposed that metabolism of amino acids is very active during germination. They would not only protein synthesis, but also provide nutrients for the growth of new tissue and the synthesis of sugars in the seed.

The determination of proline stems and roots exposed to NPK shows a strong increase of proline, this could explain as stress response. This ability of plants to the synthesis and accumulation of proline is not specific only to wheat, it is also for many glycophytes, in pea **[8]**, the barley Hordeum vulgare L. **[9]**, beans **[10]** and Nicotiana tabacum **[11]**.

The results we obtained for the mean levels of sugars showed increasing rates for wheat. This could be due to osmotic stress in response to treatment with NPK. **[12]**. Many studies confirm the accumulation of high levels of soluble sugars in different types of plants under stress conditions: water **[13, 14]**. ; saline **[15, 16]**, osmotic **[17]** and metal **[18]**.

5. References

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