

Impact of nitrogen fertilizer NPK (15.15.15) on metabolic parameters and enzyme in roots of wheat *Triticum durum*.

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Abstract. In this work we are interested in evaluating the impact of nitrogen fertilizer NPK on the roots of wheat *Triticum durum*. We followed the biomarkers of toxicity of catalase and APX. Also biochemical parameters such as average protein content, proline and soluble sugar. The main results show that the presence of NPK causes a significant increase in the average protein content, there is also an activation of the synthesis of proline and soluble sugars; for biomarkers measured there is a stimulation of the synthesis catalase activity; APX for wheat roots which results in a triggering of detoxification enzyme system.

Keywords: wheat root, CAT, APX, Protein, Proline.

1. Introduction.

The problem of pollution of the water without any doubt one of the most disturbing aspects of environmental degradation, this pollution causes a decrease in the availability of this irreplaceable natural resource. [1]. Chemicals that pollute water are insecticides, pesticides, fungicides and fertilizers. These products can be carried by runoff and pollute groundwater. Chemical fertilizers are transported into lakes or rivers by rain water and cause the degradation of the water.

The objective of this study is to evaluate the effects of nitrogen fertilizer NPK on physiological parameters and on metabolic biomarkers of environmental stress (APX and CAT) in roots of *Triticum durum* wheat.

2. MATERIAL AND METHOD

2.1. Growing seeds

The wheat seeds are grown by the method of [8], for a period of seven days; Ten seeds were first randomly selected and are then placed in a Petri dish placed on blotting paper, soaked with 8ml of distilled water at the average temperature of 20 °C.

2.2. Seed treatment.

Seed treatment is made from prepared solutions of increasing concentration based NPK (15.15.15). We selected 4 concentration and a control medium without NPK (10, 20, 30, and 40 m mole).

2.3. Determination of the average protein content.

The proteins are assayed by the method of [1]. This method uses the BSA (bovine serum albumin) as standard.

2.4. Determination of the average content of soluble sugars.

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The total soluble sugars were assayed by the method of Burnett and Schield (1960), sugars are extracted in sulfuric acid in the presence of anthrone. The assay is then performed on a spectrophotometer at the wavelength $\lambda = 585$ nm.

2.5. Determination of the average content of proline.

Proline is determined by the method of [10]. Enzyme assay. The extraction of CAT in 50 mM phosphate buffer, pH = 7.2. The spectrophotometric assay of catalase activity (CAT) is performed following the method of . The absorbance was recorded of [7]. or one minute (spectrophotometer Jenway 6300) for a wavelength of 240nm. The spectrophotometric assay of ascorbate peroxidase APX activity is carried out following the method of [11]. The APX activity is expressed as nmol / min / mg protein.

3. RESULTS

3.1. Effect of NPK on the average protein content.

Table 1. Mean levels of total protein in roots and stems of wheat seeds after 7 days of treatment of NPK.

NPK (m. Mole)	mean levels of total protein (mg / g DW) (p <0.001)	
	stems	Roots
0	15.56 ± 0.0306	12.90 ± 0.071
10	20.72 ± 0.0636	12.16 ± 0.135
20	9.97 ± 0.0473	14.36 ± 0.067
30	5.38 ± 0.0200	18.62 ± 0.301
40	5.31 ± 0.987	18.60 ± 0.497

3.2. Effect of NPK on the average content of proline.

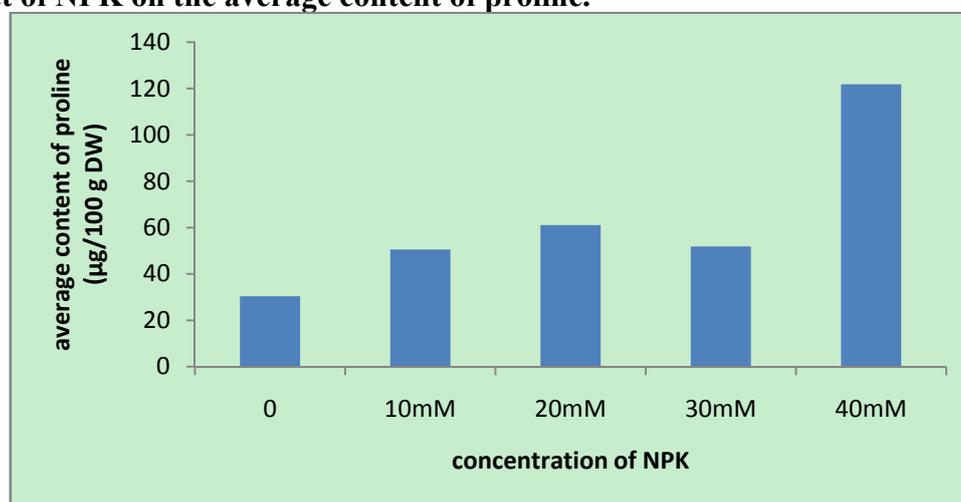


Figure 1. Effect of NPK on the average rate of proline roots from seeds wheat.

3.3. Effect of NPK on the average content of sugars:

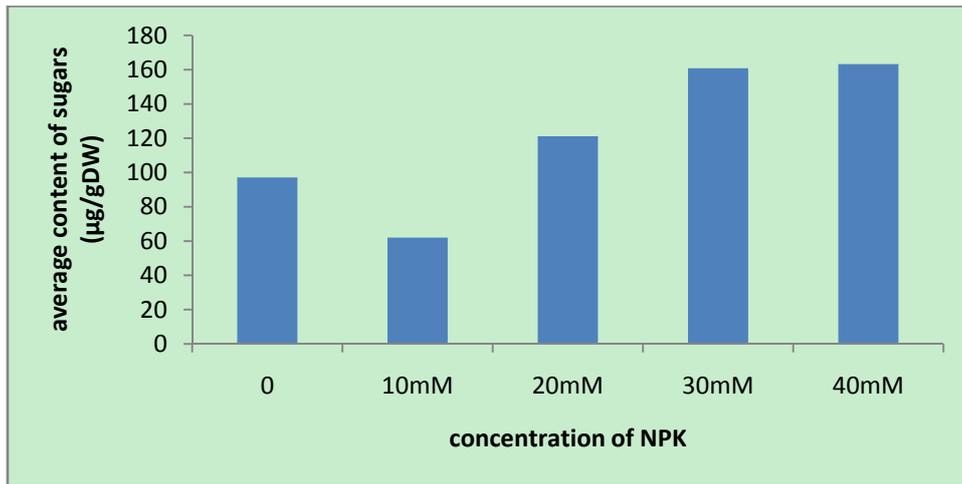


Figure 3. Effect of NPK on the average content of total sugars from roots of wheat seeds. ($P < 0.01$)

3.4. Effect of NPK on catalase.

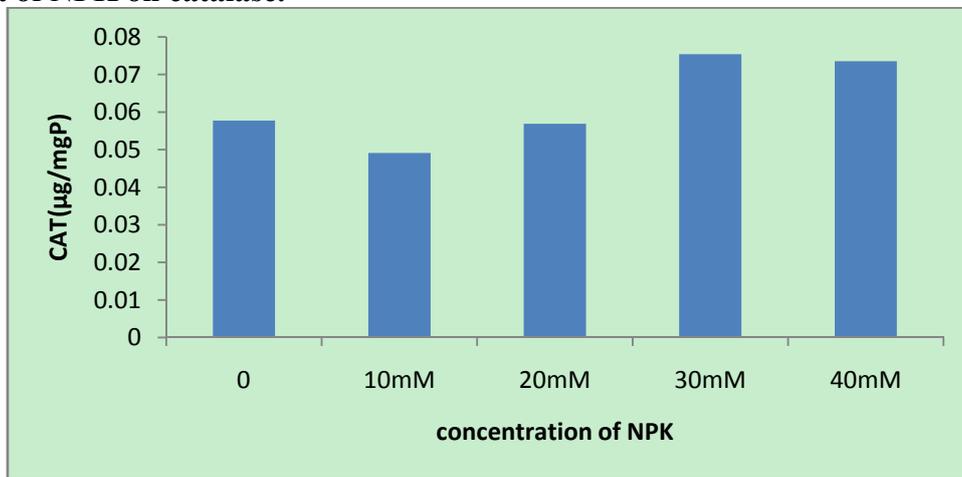


Figure 4. Effects of NPK on CAT activity in wheat roots. ($P < 0.001$).

3.5. Effect of NPK on the APX.

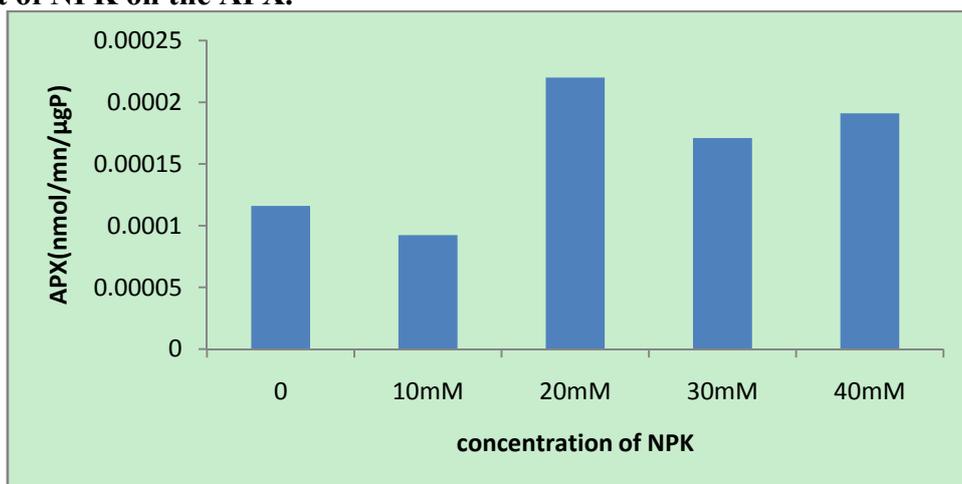


Figure 6. The APX activity in wheat roots treated with different concentrations of NPK. ($P < 0.001$).

4. DISCUSSION

Our work we have demonstrated a stimulation of protein synthesis that this is due to the fact that the presence of NPK in the tissues stimulates protein synthesis of many enzymes including those

involved in this detoxification is perfect agreement with the results of [16]. Analysis of variance was positively correlated very highly significant between the different levels of NPK and the average content of protein with $P = 0.00$ and $r = 0.99$. The dosage of proline stems and roots exposed to NPK shows a strong increase of proline, which may explain in response to stress. This ability of plants to the synthesis and accumulation of proline is not specific only to wheat, it is also true for many glycophytes, in pea [3], barley *Hordeum vulgare* L. [6], bean [4], and *Nicotiana tabacum* [14]. The study results of the ANOVA of the comparison between control and treated show a correlation not significant $P = 0.205$. The results we obtained on average levels of sugars showed increasing rates for wheat. This could be due to osmotic stress in response to treatment with NPK. [17]. The study results of the ANOVA of the comparison between control and treated showed a significant correlation $P = 0.009$ and $r = 0.91$. Our results show an increase in the amount of the catalytic activity of roots treated with different concentrations of NPK from witnesses, our results confirm the work of [2] show that stimulation of the synthesis of catalase in the presence nitrates and nitrites. Statistical analysis reveals a very highly significant difference between control and treated ($P = 0.000$). The increase in APX activity under oxidative stress caused by the NPK demonstrates its role in the elimination of hydrogen peroxide formed from the accumulation of fertilizer to the roots of wheat, APX reduces H_2O_2 water using Acrobat as an electron donor. Our results are comparable to those obtained by [15]. [9]. This confirmed by the statistical study that shows a highly significant positive correlation between control and treated with $P = 0.00$ and $r = 0.98$.

5. References

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