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Effect of different potassium levels and spraying humic acid on some physiological parameters and yield of rapeseed (*Brassica napus* L.)

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Abstract:

A field experiment was carried out at the Agricultural Research Station, College of Agriculture, University of Basrah, Karma Ali site, Iraq, during the winter agricultural season of 2022 – 2023. This study was designed to find out how rapeseed (Pactol-var) responded to different levels of potassium fertilization (0, 30, 60 and 90 kg ha^{-1}), which are represented by the symbol K_0, K_1, K_2 and K_3, respectively and was added when planting and spraying with three concentrations of humic acid (0, 4 and 8 g l^{-1}) which symbol H_0, H_1 and H_2, respectively, and added at elongation and branching stages. Experiment was applied according to randomized complete block design (R.C.B.D.) using split plot with three replications. Different concentration of humic acid were placed in main plot, while K levels was in secondary plots. The following characteristics were measured: plant height (PH), leaf area index (LAI), crop growth rate (CGR), net assimilation rate (NAR), and grain yield (*Gy*). The results obtained were as follows: The H_2 concentration was superior in terms of PH (193.5 cm), LAI (5.75), CGR (4.93 gm m^{-2} day^{-1}), and GY (2.21ton ha^{-1}), while the comparison treatment excelled and recorded the highest NAR, which amounted to 0.96 gm m^{-2} day^{-1}. The concentration exceeded K_3 recording the highest PH=196.2cm, LAI=6.16, CGR=5.22 gm m^{-2} day^{-1}, NAR=1.22 gm m^{-2} day^{-1}, and Gy=2.19-ton ha^{-1}. The interaction between studied factors had a significant effect on all studied traits, and the combination of $K_1 \times H_2$ and $K_3 \times H_2$ recorded the largest GY, which was 2.517- and 2.520-ton ha^{-1}, respectively without a significant difference between them.

Keywords: Crop growth rate, Humic acid, Leaf area index, Net assimilation rate, Potassium.

Introduction and Statement of the Problem:

Rapeseed (*Brassica napus* L.,) is one of the basic vegetable oil crops in the world. It ranks third in production after soybeans and oil palm. Global productivity of this crop estimated 71.15 million tons, global cultivated area is about 37.77 million ha and yield is 1.89 tons ha^{-1} (1).

Rapeseed oil is characterized by a small percentage of saturated fatty acids (6%) and a high percentage of unsaturated fatty acids (oleic about 80% and linoleic about 20%) compared to other oil crops, which makes it a high-quality food oil (2 and 3). Its seeds are considered an important source of antioxidants, represented by natural phenols and flavonoids, and polyphenols, flavanols derivatives, and vitamin E, which are considered biologically active compounds, (4). In Iraq, there are still few studies regarding potassium fertilization, as it was not added to the prevailing belief that it is available in the soil in a sufficient amount for the plant's needs. However, it has been shown that for thousands of years, the potassium present in the soil is the only source of potassium that the plant needs, and thus the soil in which the rate of potassium is low They are not fertile, so fertilizers are used to improve the level of nutrients in the soil, including potassium (5).

Through studies, it was found that broad-leaved crops are more in need of potassium than thin-leaved crops. Potassium is a single positively charged ion that high-end plants need, even though it is not included in any organic compound except the acids with which it combines to form organic salts. Ready potassium constitutes 1% of total potassium and is slow to decompose. It contributes significantly to supply and maintenance of potassium level ready for absorption. This process is slow and does not meet