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Short articale

Effect of foliar application of Humic acid on some Growth properties and forage yield of Oat cultivars (*Avena sativa* L.)

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Abstract: A field experiment was conducted in winter session of 2019-2020 at Almahawil, 10 Km north of Babylon governorate, Iraq (32° 29' 0.0024" N, 44° 26' 0.0024" E). The aim was to understand the effect of foliar application humic acid on some growth properties and forage yield of three Oat cultivars (*Avena sativa*), The experiment include two factors, the first one is humic acid at three levels (control, 2, 4 ml L^{-1}) which they are symbolized by H0, H1 and H2 respectively. The second factor is three Oat verities, (Shifaa, Ganzania, Carlop). The experiment design was applied as factorial experiment using randomized complete block design with three replicates. The results showed that, Ganzania under foliar application of H2 concentration of humic acid gave the highest leaf area index and crop growth rate by 7.847 and 14.661 g m^{-2} day^{-1} respectively. Moreover, foliar application of H2 and H1 on Ganzania cultivar gave highest green forage yield by 22.733, 22.500 t ha^{-1} without significant differences from foliar application of H2 on Shifaa by 22.733 t ha^{-1}. In addition, foliar application of H2 and H1 on Ganzania cultivars gave highest dry forage yield by 6.106 and 5.902 t ha^{-1} respectively.

Keywords: Oats, humic acid, cultivars, Forage yield

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1. Introduction

Oat (*Avena sativa* L.) is a major winter forage and cereal crop. It ranks sixth in world cereal production, exceeded by wheat, maize, rice, barley, and sorghum [1]. The world production of oat has been trending downward, in one hand because the emphasis being placed on competitive crops that produce greater amounts of energy or protein, In other hand, because of decreased soil fertility due to continue cultivation of this crop with lack of attention to using a good nutrition program and lack of interest in applying appropriate soil and crop service operations [2]. Global grain production of oats was 22.19 million tons come from 9.41 million hectares by 2.36 t. ha^{-1} [3]. In most production countries, oat is usually cultivated in areas which are not optimal for wheat and barley, with less input. While, recently there is high interacted by Oat in order to produced green and dry forage during low forage production season. A large number of diverse materials can serve as sources of plant nutrients. The majority of nutrient input to agriculture comes from commercial mineral fertilizers. Organic manures are considered to play a significant but lesser role in nutrient contribution, leaving aside their beneficial effects on soil physicochemical and biological properties. For instance humates are organic fertilizer has great impact on growth and plants development in several crops [4, 5, 6, 7 and 8]. One of the forms of humates is humic acid, which is commercial organic fertilizer can be used as source of nutrients in order to improve and stimulants plants growth and production. In addition, humic acid is environmentally friendly as compared to chemical fertilizer [9]. Recently, studies revealed that treat Oat with humic acid lead to increased forage yield [10, 11 and 12]. Hence, the objectives of this study were to determine the effects of different concentrations of humic acid on growth and forage yield, and to evaluate Oat verities growth under experimental conditions.

2. Materials and Methods

A field experiment was conducted during 2019-2020 season at Almahawil, 10 Km north of Babylon governorate, Iraq (32° 29' 0.0024" N, 44° 26' 0.0024" E). The aim was to investigate the effect of foliar application of humic acid on some growth properties and forage yield of three Oat cultivars (*Avena sativa* L.). A factorial experiment was applied according to the randomized complete block design with three replicates. The experiment include two factors, the first one is humic acid at three levels (control, 2, 4 ml L^{-1}) which they are symbolized by H0, H1 and H2 respectively. Deferent concentrations of humic acid applied at two times, tillering and stem elongation stage. The second