بسم الله الرحمن الرحيم

MONA MAGHRABY

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

MONA MAGHRABY

شبكة المعلومات الجامعية

التوثيق الإلكتروني والميكروفيلم

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
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MONA MAGHRABY

EFFECT OF MACRO FERTILIZER ELEMENTS AND SEEDING RATE ON PRODUCTIVITY OF TWO-ROW BARLEY

By

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B.Sc. Agric. Sci. (Agronomy), Fac. Agric., Cairo Univ., 2007

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ABSTRACT

Two field experiments were carried out during 2015/2016 and 2016/2017 winter seasons at Agric. Res. Stat., Fac. Agric., Cairo Univ. Giza, Egypt to study the effect of four NPK fertilizer rates ($N_{15}P_{7.5}K_{12}$, $N_{30}P_{15}K_{24}$, $N_{45}P_{22.5}K_{36}$ and $N_{60}P_{30}K_{48}$) and four seeding rates i.e. 100 grains m^{-2} (22 kg $feddan^{-1}$), 150 grains m^{-2} (33 kg $feddan^{-1}$), 200 grains m^{-2} (44 kg $feddan^{-1}$) and 250 grains m^{-2} (55 kg $feddan^{-1}$) on barley growth, grain yield, grain quality and nitrogen use efficiency (NUE). For growth and yield attributes, results showed that NPK fertilizers rates had significant effect on growth, yield and its attributes, grain quality traits and NUE parameters except spike length in both seasons. Also, plant height, weight of grains $spike^{-1}$ and 1000-grain weight were not significantly affected by NPK fertilizer rates in 2016/2017 season. All the studied traits increased by increasing NPK fertilizer rates during 2015/16 and 2016/17 seasons. The highest ($N_{60}P_{30}K_{48}$) rate gave the highest values of plant height, No. of shoots and spikes m^{-2}, and Grains weight $spike^{-1}$ in both seasons. the greatest No. of shoots and spikes m^{-2}, Grain weight $spike^{-1}$and spike length were obtained with the lower seeding rates (100 grains m^{-2}: 22 kg $feddan^{-1}$ or 150 grains m^{-2}) in both seasons, however, the tallest plants were observed at higher seeding rate (250 grains m^{-2} or 55 kg $feddan^{-1}$). For biological, grains and straw yields as well as harvest index, application of $N_{45}P_{22.5}K_{36}$ fertilizer rate produced the greatest of grain yield $feddan^{-1}$) and harvest index in both seasons. Straw yield feddan-1increased gradually with increasing NPK rate to $N_{60}P_{30}K_{48}$.. Biological yield of all fertilizer rate were significantly equal. Biological yield and straw yields significantly increased with increasing seeding rat up to 250 grains m^{-2} (55 kg $feddan^{-1}$) in both seasons. Seeding rate 200 grains m^{-2} (44 kg $feddan^{-1}$) produced the highest grain yield $feddan^{-1}$ and harvest index in both seasons.

Regarding the grain quality, the highest values of 1000-grains weight, grain protein content and protein yield $feddan^{-1}$ were higher with increasing NPK rate to $N_{60}P_{30}K_{48}$ in both seasons. However, the highest grain carbohydrates % was recorded with $N_{15}P_{7.5}K_{12}$ fertilizer rate and the greatest carbohydrates yield $feddan^{-1}$ was obtained with $N_{45}P_{22.5}K_{36}$ fertilizer rate in both seasons. Seeding 200 grains m^{-2} (44 kg $feddan^{-1}$) gave the highest grain protein content, grain protein yield $feddan^{-1}$ and carbohydrates yield $feddan^{-1}$) in both seasons. The heaviest grain weight was produced with seeding rate (100 grains m^{-2} (22 kg $feddan^{-1}$) in both seasons. The effect of interaction NPK rate × seeding rate was only significant on protein and carbohydrates contents. Application of $N_{60}P_{30}K_{48}$ to plots seeded with 250 grains m^{-2} gave the highest grain protein content however, the highest carbohydrates content was observed with $N_{15}P_{7.5}K_{12}$ rate × 150 grains m^{-2} seeding rate treatment in both seasons.

Regarding NUE values, the lower NPK fertilizer rates gave the highest NUE values for biological, grains and grain protein yields in both seasons. Seeding rate (250 grains m^{-2} (55 kg $feddan^{-1}$) gave the highest NUE of biological yield in both seasons. However, the highest values of NUE of grain and grain protein yields were achieved with seeding 200 grains m^{-2}. The highest values of NUE of biological yield was obtained with N15P7.5K12 × seeding rate 250 grains m-2 (55 kg feddan-1) during both seasons. However, the highest values of NUE of grain and grain protein yields were appeared with plants seeded with 150 or 200 grains m-2 and fertilized with N15P7.5K12 in 2016/17 season.

Keywords: Barely, NPK, seeding rate, yields, NUE, protein %, carbohydrates %

DEDCATION

I dedicate this work to my father's soul who support me lovely before moving to the supreme companion

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TABLE OF CONTENTS

LIST OF TABLES

INTRODUCTION

Barley is a cereal that belongs to the grass family *Poaceae*. There are three types of barley: (1) *Hordeum vulgare*: a six-rowed type of barley that has a spike notched on opposite sides with three spikelets on each notch, at each notch there is a flower or floret that later develops into a grain; (2) *Hordeum distichum*: a two-rowed type of barley that has central florets producing grains and it has lateral florets that are sterile and (3) *Hordeum irregulare*: the least cultivated, with fertile central florets and varying proportions offertile and sterile lateral florets. *Hordeum* species are found in most areas with Mediterranean climate. The genus is also represented in zones with an oceanic as well as a continental climate. This feature allows it to grow near desert areas such as North Africa.

Barley (*Hordeum vulgare* L.) is a very important grain in the world today and it ranks the fourth in both quantities produced and in area of cultivation of cereal crops in the world. The total area harvested each year is around 50 ~ 80 million ha and ranked fourth after wheat (~200 million ha), rice (120 ~150 Million ha) and corn (100 ~150 million ha). In the recent two decades, the area has been declining from more than 80 million ha to around 55 million ha. In 2019, barley production for Egypt was 108 tons. Though Egypt barley production fluctuated substantially in recent years, it tended to increase ending at 108 tons in 2019.

Barley is among the most tolerant crop plants under salinity stress, however, under the higher levels of salinity, its growth and yield production decreased. Barley also has a very good resistance to dry

heat compared to other small grains. Barley requires for less water and can be cultivated in areas where irrigation water is less easily obtainable.

Barley is used commercially for animal feed, to manufacture malt, which is primarily used in beer production, for seed and for human food applications. Feed comprises about 70 percent of barley use. About 16 percent of barley is used for malting seed or other industries and 14 percent is used for food.

Barley as feed has the same nutritive value as corn. It is found that two-rowed barley is most often used for animal feed because it produces higher weight and superior grain production. Barley is rich in carbohydrates, with moderate amounts of protein, calcium and phosphorus. It also has small amounts of the B vitamins. The entire barley grain is used as feed after it has been steam rolled or gone through a grinding process. By products from the brewing process and alt sprouts are also used in livestock feed. Sometimes barley is grown as a hay crop in some areas. Only the smooth varieties or awn less varieties are used in hay production. Winter barley also can be used for hay if pasteurized before the stems start to elongate.

A small amount of the produced barley is used for human food in the form of pearl barley or in the form of flour for porridge. The roasted grains are a coffee substitute. People use the barely grains to make medicine. Barley is taken by mouth to lower blood sugar, blood pressure, and cholesterol, and for weight loss. It is also taken by mouth for digestive complaints including diarrhea, stomach pain, and inflammatory bowel conditions. Barley water had many health benefits

could be summarized as follow: Aids in detoxification, regular usage of barley water helps flush out toxins from the body and the intestines through the urinary tract, home remedy for urinary tract infections, helps in digestion related problems. Promotes weight loss and lowers cholesterol and blood sugar.

Both two-row and six-row barley used for malting and both autumn and spring sown barley are used, but the best malt quality for beer is produced from spring sown two-row varieties.

Malt is germinated cereal grain that has been dried in a process known as "malting". The grain is made to germinate by soaking in water and is then halted from germinating further by drying with hot air.

Malts are used in the manufacture of other products. Malt flour, prepared by milling and sifting to remove the husks, is used to a small extent in baking. However, for most purposes malt is mashed, that is the milled product is mixed with warm water and sometimes with other starchy materials.

Processors of malting barley are consented about the effects of grower management factors on grain protein and other malting characteristics. Grower management strategies for malting barley production attempt to maximize grain yield and grain plumpness and minimize grain protein. The acceptable protein range for European malting barley is 9.5-11.5%. Too much protein lowers the extract yield, can give a beer that not clear, and many slow down the start germination, too little protein results in lower enzyme activity and slow growth of the yeast in the brewery.