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NITROGEN FERTILIZER AND EFFECT OF FORAGE GRASS CROPS: ARTICLE REVIEW

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ABSTRACT

The nitrogen fertilizer has a critical role in the plant growth and development processes by which the plant derives nitrogen which is in one content of cells. As a key element in the formation of many compounds whereas the most important are amino acids that compose the protein. Therefore, Nitrogen considers as important for growth and plant development and consequently for the increased outcomes. The Forage grass plants respond well to nitrogen fertilization and collect about half of the nitrogen absorbed by the plant during various stages of plant grains growth. Nitrogen positively affects the photosynthesis rate by increasing the rate of chlorophyll amount in the leaves, as it is the main element in the increase and composition of the dry matter of the plant, the size and capacity of the grin, and the final crops of grains as each ton of grain crops such as maize contain about 16 kg of nitrogen.

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INTRODUCTION

Maize belongs to the Poaceae family and the Maydeae tribe and it occupies the second place in terms of importance after wheat and first in terms of production In Iraq(Al-taweel and Qusay et al.,2020)Nitrogen fertilization using sof plant growth and is largely needed by the plant as used in the physiological processes of synthesizing chlorophyll, nuclear acids (RNA, DNA), carbohydrates, and proteins (Al-Badrani, 2013) and is the first element that determines the productivity of crops in general and forages grass crops in particular, which act to increase the quantitative and qualitative crop components yield(Al-Badrani and Rumi, 2013) in addition to its important role in the formation and strengthening of the radical group as well as participation in the synthesis of chlorophyll and nuclear acids (Pandey *et al.*, 2000). Mineral nutrition using compound fertilizers is the essence of plant life and one of the basics of increasing the quantity and quality of crops, especially fertilizers containing nitrogen and phosphorus, for the great physiological roles that these two elements play in terms of plant growth and development(Fathel et al., 2021)

Nitrogen Fertilizer And Effect Of Forage maize crop:

Maize (*Zea mays* L.) is an important grain crop due to its nutritional value in poultry and livestock nutrition, is a fast-growing and prolific crop, within a period that may not exceed three months of growth it can give more fresh fodder

(70 tons/ha) (Al-Douri, 2002) and its seeds access in manufacturing many food products used in human nutrition and the oil and dextrin industry, as well as in many industrial fields, such as; dyes, asbestos, ceramics, leaf, and cork.

Globally, several studies have been conducted to determine the maize plants needs from nitrogen fertilizer (Dawadi and Sah, 2012; Asif *et al.*. 2013 and Iqbal *et al.,* 2015). Nitrogen is exposing to washing and volatility, so distributing the additive amount of nitrogen at various stages of growth can enhance maize seeds' yield (Sangoi *et al*.,2007). In a study carried out by Alwan (2002), the various additives of nitrogen fertilizer led to a significant increase in the grain yield as a result of increased levels of nitrogen fertilizer from 0 to 60 to 120 kg N/ha for maize crop, and nitrogen fertilizer 120 kg had supremacy if given (6,693 kg/ha).

The Jassab and Al-Jubouri study (2013) indicated supremacy of fertilization 150 N/ha in grains upon fertilization levels of zero, 50, and 100 kg N/ha, giving the highest grain yield of 11.64 kg/ha, the researchers explained why the grain yield increased at the level of 150 kg N/ha that the grain yield decreases by 35% at low levels of nitrogen when the plant suffers from moisture stress compared to high levels of nitrogen.

Younis and Al-Hassan (2013) found from their study that includes four types of nitrogen fertilization treatments; without fertilization, 450 kg Na/ha in one batch in planting, fertilization of 225 batches in planting 225 kg Na after 20 days of planting, fertilization of 150 kg in planting 150 kg N/ha after 20 days of emergence and 150 kg N/ha after 30 days of the emergence, that there is supremacy in the fertilization treatment of 150 kg when planting and 150 kg N/ha after 20 days of emergence and 150 kg N/ha after 30 days of the emergence and giving 8.4 tons/ha of dry fodder, and the reason for the increase in this treatment may be due to the positive effect of nitrogen fertilization in increasing the stem diameter, and height of the plant and thus causing an increase in these two characteristics of dry feed. Daoudi *et al.,* (2015) did not find significant differences between the fertilization levels covered by their study and there was a gradual increase in the grain yield with increased nitrogen fertilization levels from 300 to 350 and then to 400 kg N/ha, However, this increase in grains yield has not reached the significant level, and this may be since the hybridization of maize responds to more nitrogen fertilizer than open-pollinated variety and composite variety. Several studies have indicated that maize hybridization in response to high levels of nitrogen fertilizer of 200 kg N/ha and above reached 357 kg N/ha (Khanzada *et al.,* 2013; Kandil, 2013; Niknam *et al.,* 2013 and Shrestha; 2013).

Jassim and Kateb (2016) found in their study five levels of nitrogen fertilizer, which are zero, 100 kg N/ha in one and two batches, and 200 kg N/ha in one and two batches. The level of 200 kg N/ha two batches had supremacy in the status of grain yield upon other levels and gave (13.8 tons/ha). Poorebrahimi *et al.*, (2018) found the increase in grain fertility when increased nitrogen fertilization levels from 0 to 80 and then 160 kg N/ha and there was also an increase in fertility when the increase of 240 kg N/ha, and this increase may be due to the positive increase in most of the observed characteristics by increasing

nitrogen fertilization levels, which was positively reflected in the increase in total grain yield. Worku *et al*.(2020) found a gradual increase in the grain yield with increased levels of nitrogen fertilization to reach its highest at the fertilization level of 360 kg N/ha, superior to the grains yield of two levels (120 and 240 kg N / ha), maybe the reason for this increase that the increase in levels of nitrogen fertilization was accompanied by an increase in the steady increase of photosynthesis that led to the concentration of carbohydrates in the vegetable part of the plant, which caused an increase in the number of corn ears and the weight of a thousand corn kernels and the increase of these characteristics eventually led to an increase in the total grain yield.

Nitrogen fertilizer and effect of forage white maize *sorghum bicolor L. Moench* :

The white maize crop is a strategic grain crop, ranking fifth after wheat, rice, maize, and barley crops in terms of food importance, production, and global cultivated areas Its grains are used as food for humans in many poor countries, and it is used as an important fodder crop as well as it enters into many other industries (Younis, 1993) and is grown in Iraq in summer under irrigation, a drought-bearing crop compared to other summer forage grass crops. The white maize cultivated area in Iraq 6,000 ha production of 7,000 tons, and cultivated in the central and southern regions (guidelines for the cultivation and production of white maize, 2002). Nitrogen is one of the key elements of plant growth and the plant needs in all its stages of growth due to its entry in many physiological processes and the needs of white maize plants for nitrogen fertilizer increase as the plant ages due to the large vegetative group, and fertilization is an important agricultural process that helps to enhance the quantity and quality of production.

The addition of nitrogen fertilizer helps in increase growth and the dry matter intake of the plant because the feed product, whether dry, sludge or soft, depends heavily on mineral nutrition, especially nitrogen, for its important contribution to the formation of the plant's green cover through its role in the functional and compositional aspects of metabolic processes in the plant Nitrogen plays a major role in increasing the yield of green and dry white maize fodder (Bakheif, 1990). White maize crop responds well to fertilization and effectiveness of fertilization depends on the cultivated variety, soil moisture and the content of the nutrients, as the addition of nitrogen fertilizer leads to increased plant height due to increased cell size and rapid division in addition to increasing the efficiency of the photosynthesis, leading to an increase in the number and length of the internodes (KuKadia and Singhania, 1982) noted that the addition of the fertilizer level of 160 kg/ha to the white maize crop led to an increase in plant height, stem diameter and feedings compared to comparison treatment, and Al-Assadi and Jaber (2001) found that the addition of nitrogen fertilizer at levels (160, 240, 320 and 400) kg/ha resulted in a significant increase in the dry weight of the shoot system, reaching (83, 133, 180) and 240 kg/ha for the four levels respectively compared to the (zero) treatment, AL-Maliki *et al*. (2012) found supremacy of the fertilization level of 160 kg N/ha upon the levels (zero, 40, 80, 120 kg Na/ha) by giving it the highest dry matter intake (17,476 tons/ha), which is consistent with the findings (Mustafa,1995 and Al-Hasani, 2001), who

noted that increased nitrogen fertilization levels lead to increased leaf area and plant height as a result of increased cellular divisions and elongation, thereby increasing dry matter. Shahandeh *et al.* **(***2*015) found in their six-year study on nitrogen fertilizer, and the return of plant residues to the soil, supremacy of the fertilizer level of 280 kg Na/ha on the comparison treatment. found a significant increase in the average grain yield by increasing nitrogen fertilizer levels from zero to 240 kg nitrogen/ha, the fertilizer level 450 kg N/ha gave the highest average for this characteristic (6.71 tons/ha) superior to the lowest level recorded by the fertilizer level of 150 kg N/ha and was (5.63 tons/ha). Pannacci and Bartolini (2018) found supremacy of fertilizer level of 100 kg nitrogen/ha with the dry matter upon the dry matter intake of fertilizer levels (zero, 50, 150 kg N/ha) in the two agriculture seasons. The researchers advised after increasing nitrogen levels to avoid increasing fertilization costs and environmental impact without taking advantage of increased levels in increasing biomass production. The results of this research showed the high potential of high maize in terms of biomass production as well when cultivated with limited inputs of irrigation and fertilization.

Nitrogen Fertilizer And Effect Of Forage millet crop:

Local Millet Miliaceum Panicum [Millet Proso] is an important animal fodder crop, especially for birds, grown in hot and dry areas of the world. Millet contains a high protein content (Younis *et al.,* 1993). Nitrogen element is an important factor that plays a major role in increasing the yield of soft and dry fodder for the millet crop, that increases the efficiency of absorption of nutrients from the soil, improves growth, and increases branching and leaf area of the plant. Aziz (2010) found a significant effect on nitrogen fertilizer levels on some of the characteristics of growth where the 40 kg N/ha treatment is higher than zero kg /N/ha treatment in fresh fodder yield when there were no significant differences in the fodder yield for the two treatments zero and 20 kg N/ha as well as between 20 and 40 kg N/ha respectively. This increase in the amount of fresh fodder may be due to the effect of nitrogen, which increases the efficiency of absorption of nutrients from the soil, improves plant growth, increases its branches and leaf area, as well as increases the size of cells as a result of their elongation and rapid division, and therefore increases the abundance of vegetative growth and this described by Ziki *et al.* (2019) in a study on the effect of nitrogen in plant growth, which included four levels of nitrogen fertilization zero, 15, 30 and 45 kg N/ha, that the highest level gave the highest amount of dry fodder and this superiority may be attributed to the increase in plant height and leaf area due to the increase in the amount of nitrogen added at this level and these results have been concluded earlier in studies similar to this study (Shahin *et al.,* 2013; Ibrahim *et al.,* 2014; Kumawat *et al.,* 2017; Bramhaiah *et al.,* 2018; Joshi *et al.*. 2018 and Thakor *et al.*. 2018). Moosavi's findings (2014) indicated that nitrogen fertilization plays an important role in increasing the dry and fresh fodder yield of millet crops, especially high levels, with the highest dry and fresh fodder at the fertilizer level of 225 kg N/ha and the lowest feed at comparison treatment. The effect of nitrogen element in increasing stem elongation and increasing leaf area has been weighted by Pandey *et al. (*2000),

the reason for this increase is that the plant root system develops further at high nitrogen levels as a result of cell division and elongation.

Nitrogen Fertilizer And Effect Of Forage Oat Crop:

Oat plant *Avena sativa* L. is a winter annual herbal plant belong to the (Poaceae) family, cultivated in many countries of the world as a dual crop for both fodder and grain purposes and ranks seventh in importance and global grain crops production, after wheat, rice, maize, barley, white maize, and millet,and it is cultivated in many countries of the world as a winter grain crop (Acarlson, Kaeppler, 2007). Oats cultivated area in the world estimates at 26.5 million hectares, producing 44 million tons. Younis and Hassan (2012) said nitrogen fertilization has had a positive impact on traits of vegetative growth, which have increased in number as the nitrogen fertilization levels increased from 0 to 50 and then to 75 to the highest level on fertilization level 100 kg N/ha at the two study sites. The increase in these traits has positively affected the increase in the yield of dry and fresh fodder, which has reached the highest values at the fertilizer level of 100 kg N/ha. Al-Rifai and Al-Hasnawi (2016) found that the grain yield of oat crop at 120 kg nitrogen/ha was higher than the grain yield for levels zero, 60 and 180, and 180 kg N/ha has superiority of straw yield upon other levels. In the study of May *et al*. (2020) which included eight levels of nitrogen fertilization (5, 20, 40, 60, 80, 100, 120, 140) kg N/ha, the 100 kg N/ha level was more profitable than other levels, and the optimal nitrogen rate was 100 kg/ha. In the end, their results indicated that the use of a nitrogen rate of 100 kg/ha provides the most economic returns. Goa *et al*. (2019) when using five levels of nitrogen fertilization (275, 300, 375, 450, 525 kg N/ha. reported that most of the studied traits increase with the increase of nitrogen fertilization and to the 3rd level (375), after this level most of the studied traits began to decrease, researchers attributed this decrease that nitrogen fertilizer is an important factor that can affect the growth and development of oats. The use of high nitrogen fertilizers can cause leaf loss to chlorophyll, affecting photosynthesis and restricting growth. Excessive use of nitrogen inhibits growth. Studies have shown an increase in plant height with the first and second levels. It then decreased with an increased amount of nitrogen fertilizer. Some researchers stressed that the use of appropriate nitrogen fertilizers can effectively improve the rise of oatmeal. While overdose has an inhibitory effect. The highest rise of the plant was obtained using the third level (375) but the dry matter increased with levels (275, 300, and 375) and then decreased with levels (525,450 kg N/ha), attributed by researchers (Zhang, 2009, Niu, 2014 and Zhao, 2016) at high levels of nitrogen, causing root inhibition, which affects the absorption of other nutrients.

Nitrogen Fertilizer And Effect Of Forage Barley Crop:

Barley is a strategic grain crop in the world used as food for humans and animals as well as its use in other industrial areas, ranking fourth after wheat, rice, and maize in terms of the importance of production and cultivated area. Although barley has been grown since ancient times in Iraq, the average yield production is still low compared to the grain-producing countries of the world (FAO,2014), perhaps the most prominent reasons for the low average yield in

Iraq is the mismanagement of the crop at critical times of its life, which makes the plant unable to exploit its genetic capabilities and thousand, (Jaddoa, 1997). Nitrogen is an essential nutrient for plants and is classified as a major nutrient needed by the plant in large quantities and if it is not available at the required level, it limits plant growth, weakens its performance and thus leads to a lack of availability. On the contrary, adding it in quantities beyond the plant's need will have undesirable effects such as increased vegetative growth at the expense of reproductive growth. The adoption of good crop management, particularly nitrogen mineral nutrition, must be based on a precise timer that coincides with the stages of formation and growth of the ingredients of the crop, which avoids the plant being exposed to food stress, which will limit the development of the ingredients of the yield and therefore the outcome (Ramos *et al.*, 1995). Accordingly, it is necessary to have an appropriate balance between the amounts of nitrogen and the dates of its addition to the plant to achieve the highest grain yield perhaps with the lowest amount of nitrogen added promptly, which achieves the first two benefits reducing the cost of purchasing nitrogen fertilizer and the second to preserve the environment from pollution, and here highlights the role of the researcher in choosing the amount of nitrogen fertilizer and the date added to achieve the highest efficiency of the plant in making the most of it Tanaka and Nakano (2019) from their study, which included three levels of nitrogen fertilization (0, 30, and 60 kg nitrogen/ha) there was no clear response to all the characteristics studied by increasing nitrogen levels Some traits recorded a decrease with increased levels of nitrogen fertilization, especially in late agriculture due to high temperatures, while there was a rise in some of the traits studied in early agriculture and the proportion of protein in grains increased both in late agriculture and in early agriculture. Kassie and Tesfaye (2019) was found in field trials to assess the impact of levels of nitrogen fertilizer on the barley crop and to determine the level of manure better than nitrogen, which gives the highest grain yield with the best quality. Nitrogen fertilization levels were five levels (0, 23, 46, 69, 92 kg/ha) in three growth seasons. The results showed that as nitrogen rates increased, grain yields increased and nitrogen in grains and grain protein content increased, although both grain crop and protein content increased with increased nitrogen rates, based on the regression equation, the use of 48 kg nitrogen/ha gave the highest economic benefit, the use of nitrogen above 48 kg/ha did not lead to an economic increase, but instead increased the cost of production. In the end, the researchers recommended that farmers reduce the use of high levels of nitrogen because even if there is an increase in grain grains, it will cause an increase in production costs without net profit. Al-Kanani *et al.,* (2019) found in a study of barley crops and its impact on different levels of nitrogen fertilizer of zero.80.60,160,120 results showed higher grain yields at high levels of nitrogen.

التسميد النتروجيني وتاثيره على محاصيل العلف النجيلية/ بحث مراجعة

سالم عبدالله يونس الغزال

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الخلاصة

إن السماد النتروجيني له دور مهم في مراحل نمو وتطور النبات كونه الركيزة الاساسية التي يستمد منها النبات عنصر النتروجين الذي يدخل في تركيب الخلايا, وهو عنصر أساس في تكوين المركبات وأهمها الاحماض الامينية التي تشكل البروتين ويعد النيتروجين من اهم العناصر الغذائية الرئيسة للنمو وتطور النبات وزيادة الحاصل ، والنباتات النجيلية تستجيب بشكل جيد للتسميد النتروجيني ويتجمع حوالي نصف النيتروجين الذي يمتصه النبات خلال اطوار النمو المختلفة في حبوب النبات ويؤثر النتروجين في معدل عملية التمثيل الضوئي من خلال زيادة نسبة الكلوروفيل في الاوراق كون النيتروجين العنصر الاساسي في زيادة وتكوين المادة الجافة للنبات ، وحجم وسعة المصب والحاصل النهائي للحبوب وان كل طن من حبوب بعض محاصيل الحبوب مثل الذرة الصفراء تحتوي حبوبها على حوالي 16 كغم N , وهناك هدفين عند اضافة الاسمدة النتروجينية لمحاصيل العلف النجيلية الاول هو زيادة حاصل المادة العلفية والثاني هو تحسين نوعية العلف الناتج وهذا ينطبق على جميع محاصيل العلف بأستثناء البقولية منها وعند اضافة كميات كبيرة من الاسمدة النتروجينية فأنها تسبب مشاكل للحيوان المتغذي على هذه المواد العلفية وهذا يعتمد على نوع المحصول وعمر المحصول, حيث عند اضافة كميات كبيرة من الاسمدة النتروجينية تؤدي الى تراكم النترات او جذر النترات والكلوسيدات وتتركز في العلف وتؤثر على صحة الحيوان عند الهضم وقد تصل الى الحد.

الكلمات الدالة: السماد النتروجيني، العناصر الغذائية، النباتات النجيلية.

REFERENCES

Al-Badrani, W. A. A. & Ibrahim A. R. (2013.) Influence different levels of nitrogen fertilization (urea) on some of the growth characteristics of two categories of Triticum aestivum L *Journal of Basic Education Research 12*(4): 723-732.

Al-Douri, Saad A. M. (2002*). Maize growth and harvester response as green feed for nitrogen fertilization under plant densities and various hem stages,* Master's degree, College of Agriculture.Uni. of Al-Mosul.pp:57

Al-Hasani, Saleh H. J. (2001) *The impact of planting dates on the growth and harvesting of two varieties of white maize.* Master's Letter - Baghdad University - College of Agriculture - Baghdad - Republic of Iraq.pp.93

Al-Kanani, Ahmed H. A., Kafah A. J. & Walid. A. A. (2019). The effect of levels of nitrogen fertilizer and the number of times the grains in the grain yield and its ingredients for barley crop. Hordum vulgar Muthanna *journal of Agriculture Science*. *7*(1):17-25

Al-Maliki, Riad J. M., Al-Akili.majid .H. & Masir.A.K. (2006). The effect of different levels of nitrogen in the growth and reach of dry matter for three varieties of white maize bicolor (L.)moench *wasit journal of science and medicine, 5*(3): 51-57.

Al-Rifai, S. I. & Al-Hasnawi .S.S.(2016). Influence of influence nitrogen compost levels and seed rates in the yield and ingredients of avena sativa L oat crop. *Muthanna Journal of Agricultural Sciences 2* (4): 1-10.

Altaweel, M . S.& Qusay A. Y .(2020). Study Of Gentic Parameters Using Half Diallel Cross In Maize. (*Zea Mays* L). *Mesopotamia Journal of Agriculture*.*48*(3):21-29.

Alwan, A. G. (2002). Nitrogen fertilization affects the distances between the holes and its components in the maize crop (Zea mayz L.). Under the conditions of Basra province. *Basra Journal of Agricultural Sciences. 150* (1): 103-114.

Asif, M.,. Saleem,M.F. Anjum,S.A. Wahid,M.A. &. Bilal.M.A. (2013). Effect of nitrogen and zinc sulphate on growth and yield of maize (*Zea mays* L.). *Journal of Agricultural 51*(4): 455-464.

Aziz, K. A. (2010). The effect of nitrogen fertilizer and the number of mattresses on the characteristics of growth and the origin panicum miliaceum L. local millet. Kirkuk University *Journal - Scientific Studies, 5* (2): 101-117.

Bakheif, B, R. (1990). Variability and Correlations in Grain Sorghum Genotypes (Sorghum bicolor [L.] Moench) Under Drought Conditions at Different Stages of Growth . Journal of Agronomy and Crop Science *164*, (5) : 355-360.

Bramhaiah, U., V. Chandrika, A.V. N. & Latha.P. (2018). Performance of fodder pearl millet (*Pennisetum glaucum* L.) varieties under different nitrogen levels in southern agro climatic zone of Andhra Pradesh. *J. Pharm. and Phytochem*., *7* (2): 825-827

Daoudi, A. H. R, Al-Jubouri,K.K & Al-Akidi. M.I. (2015). *Diyala Journal of Agricultural Sciences, 7* (12):133-147.

Dawadi, D. R. & Sah. S.K. (2012). Growth and yield of hybrid maize (*Zea mays* L.) in relation to planting density and nitrogen levels during winter season in Nepal. *Tropical Agricultural Research 23* (3): 218 – 227.

Deckard, E. J. , Lambert ,R.J. & Hageman,R.J. (1973). Nitrate reductase activity in corn leaves as related to yield of grain and grain protein. *Plant Agronma. Journal*., 3(7): 122-127.

FAO, (2014). *Food and Agriculture Organisation of the United Nations.* Rome, Italy. p. 22.

Gao, k., Yang F.Y, Zhu T. X, Gao Y., Zhao. l. X, Li. T. Q & Lin Z. L. (2019). Response of height, dry matter accumulation and partitioning of oat (*Avena sativa* L.) to planting density and nitrogen in Horqin Sandy Land. *Sci Rep ; 9*(1): 7961.

Guidelines in the cultivation and production of white maize (2002). Ministry of Agriculture, General Authority for Agricultural Research, White Maize Research Development Project.p:19

Ibraheem, F. F. R .Marwah.M. H. & Asmaa. M. S. (2021). Response of Three Varieties of Broad Bean (Vicia Faba L.) to Np Mineral Fertilizer . *Mesopotamia Journal. of Agriculture*, 49(2), 19-25.

Ibrahim, Y.M. Idris,A.E. & Marhoum, M.A. (2014). Effect of nitrogen fertilizer on irrigated forage pearl millet (Pennisetum americanum L.K. Shcum) Universal *Journal of Agricultural.* Research., *2* (2): 56-60.

Iqbal, M. A., Ahmad,Z. Maqsood,Q. Afzal.S. & Ahmad. M.M.(2015). Optimizing Nitrogen Level to Improve growth and grain yield of spring planted irrigated maize (*Zea mays* L.). *Journal of Advanced Botany and Zoology, 2*(3):1-4.

Jaddoa, K. A. (1997). Accuurate timing of nitrogen can increase barley grain yield. in: H. Nasri, R. Tutwiler and E. Thomas (edrs.). Improvement of Crop Livestock Integration Systems in West Asia and North Africa. Proceedings of the Regional Symposium on Integrated Crop Livestock Systems in the Dry Areas of West Asia and North Africa, 6-8 Novmber 1995, Amman, Jordan. ICARDA, Aleppo, Syria. pp. 40.

Jassab, Z. H. & A-Jubouri.R.K. (2013.) Yellow maize response to nitrogen fertilizer under the influence of two irrigation systems, *Euphrates Agricultural Magazine, 5* (4): 84-93.

Jassim, A.H. & Kateb.I.M. (2016). The effect of supplementary nitrogen fertilizer coefficients on the recipient and its components of four genetic compositions of maize. *Euphrates Journal of Agricultural Sciences*, *8*(3): 129-135.

Joshi, M.P., Pankhaniya. R.M. & Mohammad .N.K. (2018). Response of pearl millet (*Pennisetum glaucum* L.) to levels anddifferent nitrogen levels. *Forage* Research*., 42* (2)115-118.

Journal of International Environmental Application and Science ., 5 (3):449-453.

Kandil, E. E. E. (2013). Response of some maize hybrids (*Zea mays* L.) to different levels of nitrogen fertilization. *Journal of Applied Sciences Research*, *9(*3): 1902-1908 .

Kassie. M. ,& Kindie T. (2019). Malting Barley Grain Quality and Yield Response to Nitrogen Fertilization in the Arsi Highlands of Ethiopia *Journal of Crop Science and Biotechnology , 22,* :225–234

Khanzada, A., Khan.M.A & Akmal. M. (2013) . Nitrogen and plant density effect on maize yield and yield traits. Pure and Applied Biology. , *2*(1) : 17-23 .

Kole S. G. (2010).*Response Baby Corn (Zea mays) to Plant Density and Fertilizer Levels*. Master of Sci. Agri. , Dep. Col. Uni. Dharwad.

KuKadia, M. U. & Singhania.D.L. (1982). Heterocyst for forage yield, its components and quality characters in sorghum. Lydian *Journal of Agricultural.52*:827-831.

Kumawat, S.M., Khinchi,V. Meena.R.K. & Rakesh.S. (2017). Growth characters, fodder yield, quality and economics of pearl millet (Pennisetum americanum L.) genotype as influenced by nitrogen levels,

May,. W .E. Brandt.S. & Hutt-Taylor.K. (2020).Se of oat grain yield and quality to nitrogen fertilizer and fungicides Agricultural. agronom Jornal 112(2):1021-1034.

Moosavi, S. G. (2014). Effect of Water Stress and N Fertilizer Levels on Yield and Water Use Efficiency of Forage Millet, Annual Research & Review in Biology4(14): 2318-2326

Mustafa, H. A. (1995).*Effect of Nitrogen Fertilizer Dose and Time of Application on The Growth and Yield of Four Sorghum Hybrids* . M.Sc. Thesis, Univ .of Khartoum, Faculty of Agric .Sham bat (sedan)p.91

Niknam, N., Farajee.H. & Pourbehi. H. (2013) . Evaluation of grain yield and nitrogen efficiency indexes indifferent plant densities and different nitrogen levels in maize (*Zea mays* L.) hybrid 704. *International Journal of Farming and Allied Sciences* , *2* (12) : 306- 310 .

Niu, J. W. (2014). Reproductive allocation of Elymus nutans under different planting densities and nitrogen fertilizing treatments. *Pratacultural. Science, 31*(7): 1343–1351 .

Pandey R. K, Maranville J. W,& Chetima M. M. (2000). Deficit irrigation and nitrogen effects on maize in a sahelian environment. II. Shoot growth, nitrogen uptake and water extraction *Agricultural. Water Management*; *46:*14-27.

Pannacci E. & Bartolini.S.(2018). Effect of nitrogen fertilization on sorghum for biomass production. *Agronomy Research 16(5):2146-2155*

Poorebrahimi. M., A. Sirusmehr. H. Eshghizadeh, M. Asgharipour. M. & Khamaari.L. (2018). Effect of Different Levels of Nitrogen Fertilizer on Yield and Agronomic Characteristics of Different Corn (*Zea mays* L.) Hybrids. *Journal of Crop Production and Processing, 8* (3) :37-49.

Ramos, J. M., Dela,I. & Garcia.L.F. (1995). Barley response to nitrogen rate and timing in a Mediterranean environment. J. Agric. Sci. Camb. 125: 175-182. 20. Royo, C. and F. Tribo. 1997. Triticale and barley for grain and dual-purpose (forage + grain) in a Mediterranean. Australian Journal of Agricultural Research.*48*(4): 423-432.

Sangoi, L., P. Ernani,R.& da Silva, P.R.F. (2007). Maize response to nitrogen fertilization timing in two tillage system in a soil with high organic matter content . Revista Brasileira de Ciência do Solo (31)507-517.

Shahandeh, H., Hons, F. M., Wight, J. P. & Storlien, J. O. (2015). Harvest strategy and N fertilizer effects on bioenergy sorghum production. AIMS Energy 3(3), 377 400 Pannacci, E.; Bartolini, S. Evaluation of chemical weed control strategies in biomass sorghum. Journal of Plant Protection Research.*58*, 404–412

Shahin, M.G., Abdrabou,R.T. Abdelmoemn,W.R. & Hamada,M.M. (2013). Response of growth and forage yield of pearl millet (*Pennisetum glaucum* L.) to nitrogen fertilization rates and cutting height. *Ann Agricultural.* Scientific., *58*(2): 153-162.

Shrestha, J. (2013). Effect of nitrogen and plant population on flowering and grain yield of winter maize. *Sky Journal of Agricultural Research,* 2(5) : 64 -68.

Tanaka, R., & Nakano, H. (2019). Barley yield response to nitrogen application under diferent weather conditions. Scientific *Reports*, 9, 8477.

Thakor, K. P., Usadadia,V.P. Savani,N.G. Arvadia,L.K. & Patel ,B.P.(2018). Effect of irrigation schedule and nitrogen management on productivity, profitability of summer pearl millet grown under clay soils of south Gujarat. *Int. Journal of Agricultural. Innov. Research,., 6* (4): 10- 11.

Worku, A., B. Derebe, Y. Bitew, G. Chakelie and M. Andualem.(2020). Response of maize (*Zea mays* L.) to nitrogen and planting density in jabitahinan district, western amhara region. *Cogent Food Agricultural., Vol. 6. 10.1080/23311932.2020.1770405.*

Younis, A. A. (1993). *Production and Improvement of Field Crops*. Book House for Printing and Publishing, Ministry of Higher Education and Scientific Research, Republic of Iraq.p.65

Younis, S. A. & Al-Hassan A. M. (2012). *The Effect of Nitrogen Fertilization and The Development of Growth in The Characteristics of Growth and The Harvester of Oatmeal Varieties. . Avena sativa L*. Issue of the Second Scientific Conference of the College of Agriculture University of Karbala .547-563.

Younis, S. A. & Al-Hassan A. M. (2013). The effect of nitrogen fertilization and the development of growth characteristics in the growth characteristics and harvester of maize feed. *Tikrit Journal of Agricultural Sciences. 13* (4): 156-163.

Zhang, H. Y. (2009). Research and development of oat. *Cereals and Oils.* 8, 7-9.

Zhao, H. K. (2016). The reproductive allocation of Avena sativa under different planting densities and nitrogen addition treatments. .*Pratacultural Science.* 33(2), 249–258.

Ziki, S. J. L., Zeidan,E.M., El-Banna,A.Y. & Omar,A.E. (2019). Growth and forage yield of pearl millet as influenced by cutting date and nitrogen fertilization. *Zagazig Journal of Agricultural Research. 46* (5): 1351-1361.