SalahaddinUniversity
College of Science

Health and Environmental Science Dept.

Impact of hand produced of liquid bio fertilizer on vegetative growth and some chemical content of wheat (*Triticum aestivum* L.)

Research project

Submitted to the department of (environmental and health science) in partial fulfillment of the requirements for the degree of

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Abstract:

This research was carried out in the glass house of the college of science , University of Salahaddin-Erbil during November 25th 2022 to March 12th 2023, to evaluate the growth, water and chlorophyll content of wheat (*Treaticum aestivum* L.) response to Lactic Acid Bacteria in fermented milk and Fermented Plant Juice and there combination . which used two levels of Lactic Acid Bacteria (0,50ml) and two levels of Fermented Plant Juice (0,27.7ml) .The treatments included parameters such as plant height (cm) which measured every20 days of treatment (20,40,60 and80days), , flag leaf area(cm^2), spike length, (cm), tiller number.$plant^{-1}$, number of leaf. $plant^{-1}$, water content (gm) and chlorophyll content in leaves (at leaf). The result showed that the application of Fermented

Plant Juice and lactic acid bacteria in fermented milk have non significant ($p \geq 0.05$) effect on plant height (cm) in 20 days and 40days after treatment compared to control. while Lactic Acid Bacteria in fermented milk and combination treatment have significant($p \leq 0.05$) effect on plant high (cm) in (60,80 days)after treatment compared to control. Whereas Lactic Acid Bacteria in fermented milk and Fermented Plant Juice combination of them have significant ($p \leq 0.05$) effect on chlorophyll content (at leaf) compared to control, while Fermented Plant Juice and Lactic Acid Bacteria in fermented milk have nonsignificant ($p \geq 0.05$) effect on spike length (cm), flage leaf area (cm^2) and water content compared with control.

Key words :- wheat, lactic acid bacteria in fermented milk, fermented plant juice, bio fertilizer

INTRODUCTION:

Agriculture is an important economic sector in many countries, and according to the FAO, 37% of the global land area is dedicated to agriculture. However, increasing the usage of chemical fertilizers affects ecological balance and food safety and is the main causative factor of land and water pollution. In recent years, sustainable agriculture has drawn the attention of the global community, and this approach promotes organic farming in the context of soil health, securing environmental quality. The interaction between plants and microbes is an integral part of sustainable agriculture. Therefore, microbial-based agricultural practices and advancements could promote plant health and soil fertility. (Raman , e*tal* ., 2022). Lactic acid bacteria used as bio fertilizer increases nutrients use efficiency and open new routes of nutrient acquisition by plant, thus micro-organisms applied to plants can have a dual function of biocontrol agent and bio stimulant.(Halima, *etal.,* 2020). Fermented plant juices (FPJ) in agricultural production, entails the identification of various cost-effective, safe and eco-friendly sources of nutrients for organic crop production. The formulation and application of fermented plant juices, a mixture which can improve soil fertility and enhance growth. It is a mixture of chopped plant shoots or leaves and molasses that is fermented for a week or less and diluted to water. The mixture is

then used as foliar fertilizer or drenched in to the soil.(Racoma, *etal*., 2017). Wheat is an especially critical component of global food supplies. This single crop accounts for about one-fifth of the total calories and total protein consumed by the planet's 7.9 billion people each and every year (FAO, 2020) Wheat is one of the world's necessary food cereal crops as well growing in large areas. It is an important cereal food crop that provides many essential nutrients to humans and animals. Wheat is well known as stable food and meet the food requirement of the human population globally .(Bhutto, *etal.,* 2021).

The aim of this study uses of lactic acid bacteria and fermented plant juice as a bio fertilizer for growth of wheat plant.

Material and methods:-

This research was carried out in the glass house of the college of science , University of Salahaddin-Erbil during November 2022 to 2023, to study the effect of hand produce liquid bio fertilizer on chlorophyll content , water content and some vegetative growth of wheat plant,

Preparation of soil:

The plastic pots with diameter of 18cm and 18.5cm in height were used in this experiment, each pot packed with 7kg of air-dried soil.

Seed treatment:

Before planting, wheat grains were surface-sterilized in 3% sodium hypochlorite solution for 10 minutes and then soaked in distilled water for 12hours (Li, 2005), then(5)grains were planting in each pot after germination thinned to(4)plants.

Preparation of hand liquid bio fertilizer:

First step for preparation fermented plant juice the we collected plants (Swisschard, Lettuce ,Radish Leaves ,Alfalfa) .then chopped the plant .in second steps mixed the chopped plant with water and molasses or brown sugar .we used plastic container the mixture of chopped plant and molasses must less

than 2/3contenar to prevent mold growth .after that Cover the mouth of the container with handmade paper and leave in shade. let it for 15 days until have light alcohol smell .Before using we diluted it with distilled water in 500ml.As it shown in figure (1). (Kevin, etal., 2021).lactic acid bacteria was prepared from fermented milk by fermented rice wash. First step for preparation wash rice then collect the water of washing rice then add in glass container then cover the container by handmade paper and Lactic acid bacteria will propagate at 23 to 25 C, and the solution will start to smell sour. let it for 7 days then add 100ml to one letter of milk and close it by handmade paper then let it for 7 days until the crud and serum produced which shown in figure (2). After that we separated serum from crud we can use crud as a food for animal and the serum after dilution used for wheat as a bio fertilizer. (Patrycja,etal., 2022)

(A) **(B)** **(C)**

Figure (1): steps preparation of fermented plant juice A-chopped plants b- after 7days c- after 15 days

(A) **(B)** **(C)** **(D)**

Figure (2): steps preparation lactic acid bacteria from fermented milk A- fermented rice wash B- fermented rice wash with milk C- separation serum and crud D- crud

Levels use of liquid bio fertilizer:

Fertilizers treatments consist of two levels of (0,50ml) lactic acid bacteria and two levels (0,27.7ml) of fermented plant juice. Both of them add as an irrigation was applied (20) days after germination.

Statistical analysis:-

The data of this study was designed according to Factorial Completely Randomized Designs (Factorial C.R.D) with three replications and four treatments. All the data were analyzed statistically using Statistical Package for Social Sciences (SPSS version 25 software). Duncan Multiple Range Test were used for the comparison of treatment means at 5% for green house parameters and 1% for laboratory parameters by the computer using SPSS program (Al-Rawi and Khalafulla, 1980)..

The following parameters were measured:

1- plant hight (cm)

hight of plant measured every 20 days after treatments.

2-water content (gm)

Water content was measured by fresh weight minus dry weight after drying in oven at 75 ^{0}C until reach the constant weight.

3- Flag leaf area(cm^2)

The area of flag leaf was measured according this formula by adopting Sticklers linear measurement method (Stickler *etal*, 1961)

Leaf area cm^2 =L*B*0.747

L=length of leaf, B=width of leaf

4-Spike length (cm)

5-**Total chlorophyll content determination**

Total chlorophyll content in leaves estimated by chlorophyll meter (SPAD) with at leaf device by clipping the sensor on the leaf (saheed *&* Qader*,* 2020)

Results and Discussions:-

The data present in table(1) indicated that Fermented Plant Juice and combination treatment significantly($p \leq 0.05$) affected on increasing plant height in (60 and 80 days) after treatment compared to control. While non-significantly affected plant height in other days after treatment. The maximum value (30.00, 59.33, 70.66, 74.33and 61.00) were recorded in (C,L,F,L&F treatments) of (20, 40,60,80days) respectively. While the minimum value (5.33, 7.00, 11.66, 12.60 and 15.90cm) of plant height was recorded in treatments (C, L, F, L&F) 0f (20, 40, 60 and 80days) respectively. The result is agree with (Lamont *et al*.,2017) that lactic acid bacteria in root rhizosphere increase wheat height .the organic fertilizer like fermented fruit juice is good source of plant nutrients to improve the

physical properties of soil were response for vigor growth and development of plants.(Tagotong and Corpus., 2015) .

Table (2) shows that Lactic Acid Bacteria in fermented milk and Fermented Plant Juice have non-significant($p \geq 0.05$) effect on flag leaf area (cm^2) , spike length (cm) and tiller number.$plant^{-1}$ compared to control .were as the lactic acid bacteria in fermented milk have a significant($p \leq 0.05$ effect on number of leaves .$plant^{-1}$, The highest value (5.33, 4.56.$plant^{-1}$, 6.3333cm and 23.21cm^2) of (number of leaves, tiller number ,spike length and, flag leaf area) recorded in the (F, L, (L and L&F) and C) treatments respectively while the lowest value (3.33,3.36, 4.6667 and17.35) were recorded in the (L,L&F, C and L&F) respectively.

Figure (3) shows that Lactic Acid Bacteria from fermented milk , Fermented Plant Juice and combination treatment have a significant effect ($p \leq 0.05$) on total chlorophyll content in wheat plant compared to control. The highest value (54.6 at leaf) was recorded in Fermented Plant Juice treatment and the lowest value(31.766at leaf) was recorded in control .this result was agreed with .(Raman, etal., 2022) found that LAB produces enormous organic acids during food and backer waste ferment .For this reason, LAB-based composting materials are well suitable for alkaline soils that promote phosphorous and iron precipitates, such as Ca phosphates and iron oxides . Those conditions led to a significant availability of Mn, Fe, and Cu in soils. Some hypothetical views revealed that LAB fix atmospheric nitrogen and produce iron-chelating compounds.

Figure (4) showed that the application of lactic acid bacteria in fermented milk and fermented plant juice non significantly ($p \geq 0.05$) effect on water content (gm) compared to control the highest value (0.45gm) was recorded in combination treatment (L&F) .While the lowest value (0.32gm) was recorded in fermented plant juice treatment (F).

Table (1):- Effect of lactic acid bacteria in fermented milk and fermented plant juice on wheat plant length (cm) in after twenty days of treatments.

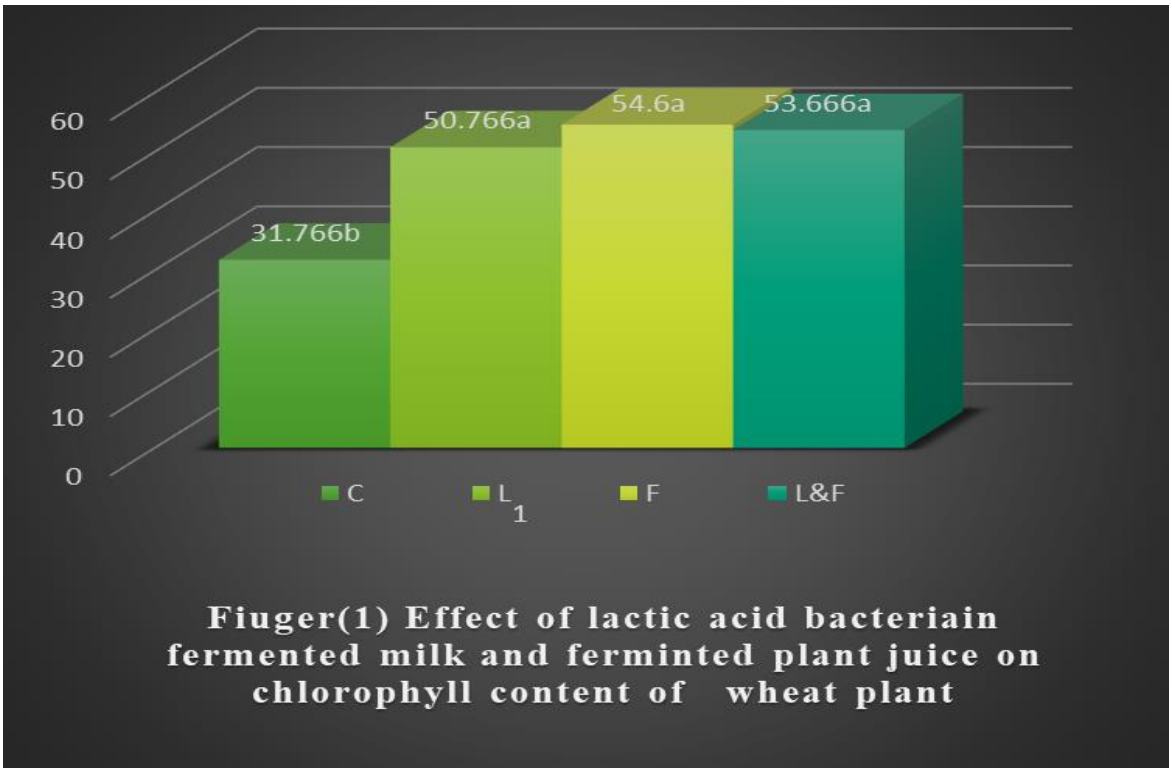
Treatment	20Day	40Day	60Day	80Day
C	5.33^{a}	16.56^{a}	18.83^{b}	59.33^{b}
L	7.00^{a}	11.66^{a}	30.00^{a}	70.66^{ab}
F	5.33^{a}	15.90^{a}	30.00^{a}	74.33^{a}
L&F	8.33^{a}	12.60^{a}	23.66^{ab}	61.00^{ab}

C=control, L=Lactic acid bacteria in fermented milk, F=Fermented plant juice

Table (2):- Effect of lactic acid bacterium fermented milk and fermented plant juice on some vegetative growth of wheat plant.

Treatment	Number of leaf .plant^{-1}	Tiller number .plant^{-1}	Number of spik.plant^{-1}	Flag leaf area (cm^2)
C	5.33^{a}	3.43^{a}	4.66^{a}	23.21^{a}
L	3.33^{b}	4.56^{a}	6.33^{a}	19.63^{a}
F	4.33^{ab}	3.53^{a}	5.00^{a}	21.61^{a}
L&F	3.66^{ab}	3.36^{a}	6.33^{a}	17.35^{a}

C=control, L=Lactic acid bacteria in fermented milk, F=Fermented plant juice



Fiuger(1) Effect of lactic acid bacteriain fermented milk and ferminted plant juice on chlorophyll content of wheat plant

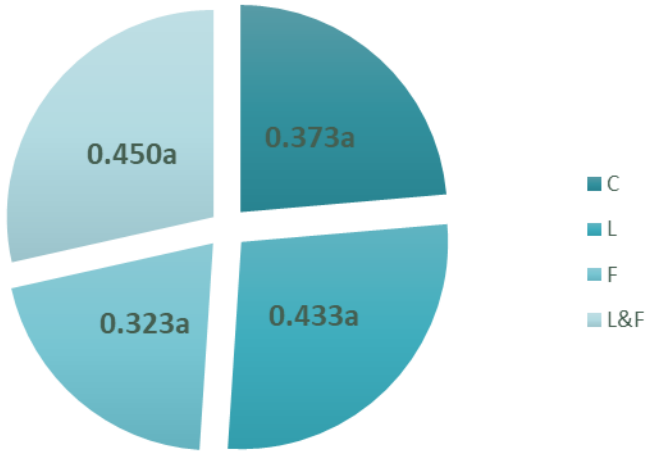


figure (4): Effect of lactic acid bacteria in fermented milk and fermented plant juice on water content (gm) of wheat plant

4- CONCLUSION

The study was mainly focusing on the effect of lactic acid bacteria in fermented milk and fermented plant juice on some vegetative growth and chlorophyll content of wheat (Triticum aestivum L.) The result showed that the Fermented Plant Juice and combination treatment significantly($p \leq 0.05$) affected on increasing plant height in (60 and 80 days) after treatment compared to control, while lactic acid bacteria in fermented milk treatment have non-significant effect on plant high (cm) in all days compared to control. Whereas Lactic Acid Bacteria from fermented milk , Fermented Plant Juice and combination treatment have a significant effect ($p \leq 0.05$) on total chlorophyll content in wheat plant compared to control, while non-significant($p \geq 0.05$) effect on flag leaf area (cm^2) , spike length (cm) and tiller number.$plant^{-1}$ water content compared to control .

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