

## The Effect of Foliar Spraying with Calcium Chloride and Fertilization with Fish Protein Hydrolysate on the Growth and Yield of Some Cucumber Hybrids Grown in Plastic Houses

Aqila Jumaah Hachim ; Jamal Abdul Redha AL-Rabea'a ; Asmahan Shayal Abdalkarim & fatimah mahdi jasem

Department of Horticulture and Landscape Engineering - College of Agriculture - University of Basrah – Iraq

[aqeela.hajam@uobasrah.edu.iq](mailto:aqeela.hajam@uobasrah.edu.iq); [jamal.abdulredha@uobasrah.edu.iq](mailto:jamal.abdulredha@uobasrah.edu.iq); [Asmahan.abdulkareem@uobasrah.edu.iq](mailto:Asmahan.abdulkareem@uobasrah.edu.iq) & [fatima.jasem@uobasrah.edu.iq](mailto:fatima.jasem@uobasrah.edu.iq)

### I. Abstract

The study was conducted to investigate the effect of foliar spraying of calcium chloride and fish protein hydrolysate at the stage of 4-5 true leaves on the growth and yield of some cucumber hybrids Sayff, Shady, Darina, Super Faris and Ballistic. The study included eight factorial treatments that are possible combinations between four levels of calcium chloride (3, 2, 1, 0%) for the hybrids sayff and shady and the addition of fish protein hydrolysate (0, 2, 4, 6)% for the hybrids Darina, Super faris and Ballistic. The results showed that the hybrid Shady was significantly superior with an increase of 11.36% in plant height, 6.31% in stem diameter, 24.39% in fresh weight of the plant, 13.48% in dry weight of the plant, 4.29% in moisture percentage, 15.24% in average weight of the fruit, 18.16% in vitamin C content of the fruit, and 9.99% in the percentage of potassium ions penetrating the fruit. 38.97% in the calcium content of fruits compared to the Sayff variety. While the plants of the Sayff variety were superior significantly and by an increase of 12.92% in the early productivity of the plastic house compared to the plants of the Shadi variety. The plants are sprayed with calcium chloride and treated with a concentration of 3% were superior significantly in the fresh weight of the plant by an increase of 14.73% in the calcium chloride content of the fruits by 292.83% and a significant decrease in the percentage of potassium ions penetrating the fruits and a significant increase in the total productivity of the house by 19.98% compared to the comparison treatment. Plants treated with 6% fish protein hydrolysate were significantly superior in all of the rated vegetative traits, root and flower growth indicators and total yield. The Darina variety also outperformed the rest of the varieties in fruiting traits and total yield.

*Keywords: Cucumber hybrids, calcium chloride, fish protein hydrolysate, plastic houses.*

### II. Introduction

*Cucumis sativus L.* is one of the important summer vegetable crops in Iraq. It is grown in two seasons, spring and autumn, and it can also be grown in a protected environment. The fruits are usually eaten either fresh or pickled. Its fruits contain 96% water, and every 100 g of fruits contain 0.7 mg of protein, 14 calories, 24 mg of calcium, 20 IU of vitamin A, 0.075 mg of riboflavin (vitamin B2), and 0.3 mg of niacin (Matloub *et al.*, 1989).



The cultivated area of it in Iraq in 2007 reached about 5000 hectares with a production of 480000 tons and a low production rate of 8.727 tons/hectare (FAO, 2009). In order to improve plant productivity in the country, some important agricultural operations must be applied on correct scientific bases, including chemical fertilization. Among the important major elements necessary for the plant is calcium, which has many physiological functions in the growth and development of the plant, as it enters into the formation of pectin materials that bind the cell walls and in the formation of the middle plate. The role of calcium in reducing spoilage during storage, as fruits containing high concentrations of calcium gain resistance to infection by microorganisms that cause spoilage after storage. It also increases the hardness of the fruits because it enters into the composition of the cell wall and is an important element in the cohesion of pectin, which increases the hardness of the cell wall (Bangerth *et al.*, 1972). Therefore, calcium deficiency below the minimum level leads to cracking of the fruits. This is due to the nature of divalent calcium, which increases the strength of the cell walls inside the fruits by forming pectins that bind with calcium and increase the resistance of the fruits to internal pressure (Siddiqui and Bangerth, 2004). Liang *et al.* (2008) found that spraying cucumber plants grown in greenhouses with calcium chloride at a concentration of 15 mmol/L gave the best results in encouraging plant growth by increasing the rate of photosynthesis and improving the yield. Due to the lack of previous studies on The effect of spraying with calcium chloride on the growth and growth of hybrid cucumber varieties Saif and Shadi grown in plastic houses under desert conditions in Basrah Governorate, this study was conducted.

In In 2015, the area cultivated with this crop in Iraq peaked at 82,160 dunums. The total production was 156,334 tons, at a poor rate of 1.902 tons per dunum<sup>-1</sup>.(Central Statistical Organization, 2016). Cucumber production can be increased by expanding the cultivation area or by using high-quality varieties and following advanced agricultural practices. However, it is difficult to increase the area due to the negative impact on the cultivation of other vegetables. Therefore, the best way to improve cucumber productivity is to select high-yielding genotypes that suit the available agricultural conditions within the specified area. (Al-Rawahi *et al.*, 2011) Since the genotypes of Parthenogenetic cucumber do not need pollination and fertilization to grow fruits, and they are far more active in the norm cucumber varieties. In addition, their economic worth is more because seedless fruits cost higher prices than seed fruits (Thapliyal, 2017). Many rich countries have started the shift to organic farming, cut the use of chemical compounds as much as possible. It try to produce plants free of toxins from pesticides and chemical fertilizers, resulting in clean and healthy crops (Farhan, 2008). The meat of fish contains minerals such as calcium, phosphorus, salt, and magnesium, in addition to rare elements such iodine, iron, copper, and vitamins B, A, and D. Many people living in sea and beaches use fish as their main source of food. Several studies show that fish waste includes bones, intestines, skin, scales, and fins, indicates about half of the fish's weight and is an important source of protein, enzymes, and oil (Bhaskar and Mahendrakar, 2008). Waste is the waste of everything we use and is considered as one of the more major pollutants in the environment. The types of waste vary depending on their source. For example, slaughterhouse waste increases the growth of flies and pathogenic microbes by offering an ideal environment for their growth and disease transmission. The waste is quickly taken up by a kind of microbe known as decomposers.(Balkhandev, 2020) Looking on, defines must be developed that boost crop yields and provide the perfect diet for plants in order to

preserve soil biodiversity and prevent environmental pollution, which causes high-quality food production and sustainable harvests (Ronga *et al.*, 2015).

## 2- The study's objective

- 1- Study the effect of spraying calcium chloride on a cucumber hybrid.
- 2- Study if irrigation with a hydrolyzed fish protein extract solution changes the growth and yield of three female cucumber hybrids.
- 3- Production of an organic crop free of chemical pollutants..
- 4-Introducing new hybrids to Iraq to find out the best of them
- 5- Reduced fish waste and the unpleasant odors it gives off in the stores.

## 3-Review sources

### 3-1Effect of Hybrids

Hybrids play a vital role in enhancing overall productivity due to their high yield, early maturity, excellent quality, and disease resistance. Rapid increase in productivity per unit area can be achieved by using high quality seeds, new hybrids, and applying modern technologies (Tomar, 2017). Since parthenocarpic cucumber does not require pollination and fertilization for fruit production, its production potential is superior to that of conventional cucumber varieties. In addition, it has a high economic return, with seedless fruits being of higher value than seeded fruits (Thapliya, 2017). Cucumber genotypes have high cross-pollination capacity and wide genetic variation in vegetative growth and fruit characteristics. Since it is monoecious in nature, it is ideal for hybrid seed production. Therefore, hybridization in breeding programs is considered one of the most effective tools to exploit genetic diversity in cucumber (Hemant and Tiwari 2018). Plant breeders have to know methods to generate female seeds in order to fiscally build hybrid cucumber uses in greenhouses. Seedless cucumber fruits are of great curiosity for consumers all over the world, as cucumbers in the open field tend to be either hard to the touch, while in greenhouses they have high and desirable characteristics (Kumari *et al.*, 2021). The introgression method is one of the methods of plant breeding and improvement in an easy and fast way to obtain good genetic structures that can be tested under the conditions of the importing country and the selection of what suits the environmental conditions by the specialized scientific research centers (Hassan, 2005).

### 3-1-1Effect of hybrids on vegetative growth

traits Abdullah *et al.* (2012) found in a study of three hybrids of cucumber plants grown in plastic houses (Hadeel, Toshka and Shabah) that the hybrid Toshka was significantly superior in plant height compared to the rest of the hybrids. Al-Shammari and Saud (2013) noted when planting three hybrids of cucumber (BF 372, AS1 0001, AS2 001) grown inside unheated plastic houses that the hybrid AS1 was significantly superior to the hybrids AS1 and BF in plant height, which



reached 3.44. Al-Bayati and Kamel (2014) in a study to evaluate two hybrids of cucumber Dates, Sayff grown under unheated plastic houses, where the hybrid Dates was significantly superior in the number of leaves compared to the hybrid Sayff, while there was no significant difference in the plant height trait between the two hybrids. Yousefi (2016) observed a study to evaluate three cucumber hybrids: Saturn, 195, and 29. The results revealed that the 195 hybrid was significantly superior in plant height and stem diameter compared to the other hybrids. Hussein and Atallah (2017) indicated in a study of two cucumber hybrids grown in an unheated greenhouse, namely Grass and Karima, the results showed that the Karima hybrid was significantly superior in plant height, number of leaves, and dry weight of the vegetative group compared to the Grass hybrid. Al-Mutawwari (2010) The growth of two cucumber hybrids, Sayff and Shady, under unheated greenhouse conditions found that the Shady cultivar beat the Sayff cultivar in terms of plant height, stem diameter, and fresh and dry weight. Ehiokilen and Samson (2010) carried study on two cucumber hybrids, Palmetto and Ashley, under covered cultivation conditions. The Palmetto hybrid came out much better over the Ashley hybrid in terms of plant height, leaf number, and leaf area. Abdullah et al. (2012) did a study to evaluate the performance of three cucumber hybrids, Hadeel, Toshka, and Shabah, at the winter season.2003-2004 and 2004-2005, results showed that the hybrid Toshka had significantly greater height of plants in both seasons. The percentage of rise in height was (21.1% and 37.95%) and (11.9% and 32.21%) compared to the hybrids Hadeel and Shabah.. Al-Mohammadi and Al-Naif (2013) confirmed that the cultivation of two cucumber hybrids, Sayff and Ryan, during the seasons of 2012 and 2013 under unheated greenhouse conditions, showed that the hybrid Sayff was significantly superior in leaf area and number of leaves during the 2012 season compared to the hybrid Ryan. However, in the 2013 season, no significant difference was observed between the two hybrids. Neither hybrid showed a significant effect on the dry weight of the total Green in both seasons. In a study conducted by Sahoo (2014) to evaluate five cucumber hybrids namely, Himangi Isatish, Hilton, Alamgir\_ct\_180, Poona. Khira grown under protected conditions, the results showed that Isatish hybrid was significantly superior in plant height and total leaf number compared to other hybrids. In a field experiment conducted by Chikezie *et al* (2016) to evaluate sixteen cucumber hybrids, including Straight, Table green, Poinsett, Centriolo, Regal, Sumter, Ashley, and Marketer, Calypso, W12757, MarketMore 76, Royal F1, Beit Alpha 8, Delilha, Zeine, Palmetto, the results showed that Ashley hybrid was superior in plant height and leaf number, recording the highest values. On the other hand, Sumter hybrid was characterized by increased leaf area. Vian (2016) in her study of five cucumber hybrids, namely Faris, Sayff, Silyon RZ, BARAA 138 and Dalia, indicated that Silyon RZ beat other hybrids in terms of plant height. Al-Ibrahimi (2017) went to a study examining four types of cucumber hybrids in a protected environment: Baraa 138, Silyon, Rami, and Sayff. The results showed that the hybrids Baraa 138 and Silyon differ compared to other hybrids in terms of plant height and stem diameter. The hybrid Sayff had a much higher total leaf number, however there was no significant variations in leaf area between the hybrids. Hassan and Atallah (2017) looked at the cultivation of two cucumber hybrids. namely Grass and Karima, the results showed that the hybrid Karima was significantly superior to the hybrid Grass in height of plant, number of leaves, and dry weight of the vegetative group. Al-Bayati (2020) was a 2020 study on the cucumber hybrids Zain and Sultan grown in unheated plastic houses. The hybrid Zain significantly beat the hybrid Sultan in terms of plant height, number of leaves, leaf area, and plant length. Mohammed *et al.* (2020) conducted a study to evaluate the effect of growing several hybrids of cucumber under protected cultivation conditions, which included three locally produced hybrids at the



College of Agriculture at the University of Anbar (H2, H3, H4) and compared them with a hybrid approved by the Iraqi Ministry of Agriculture (H1) during the fall seasons 2018-2019. The hybrid (3H) showed significantly more leaf area and dry weight in both seasons, with 110.69 dm<sup>2</sup> and 88.84 g in the fall and 117.20 dm<sup>2</sup> and 96.41 g in the spring. Hassan's (2020) study regarding the growth and germination of two cucumber hybrids (Beitha alpha, Biyar dalta) showed that the hybrid Beitha alpha was significantly larger in height and dry weight to the vegetative group by 12.27 cm and 6.55 g, respectively compared to the hybrid Biyar dalta. Albayati (2020) reported on the cultivation of two cucumber hybrids, Zain and Sultan, and found that the hybrid Zain beat the hybrid Sultan in plant height, number of leaves, and leaf area. Albayati *et al.* (2023) conducted a study to evaluate the effect of planting three cucumber hybrids (Ronnie, Modhesh, and Bahir), and their results showed the new hybrid Ronnie beat each of the other two in terms of plant height.

### 3-1-2 Effect of hybrids on leaf chemical components

In a study conducted by Rasool *et al* (2009), two hybrids of cucumber were grown in a protected environment, namely "Storm" and "Sultan". The results showed that the hybrid "Storm" was significantly superior to the hybrid "Sultan" in the percentage of chlorophyll in the leaves. In a study conducted by Abdulrahman *et al* ,(2013) on two hybrids of cucumber, Maxeem and Summit, the results showed that the hybrid Maxeem was significantly superior in the total chlorophyll content of the leaves by (38.280%) compared to the hybrid Summit. Al-Shammari and Saud (2013) reported that when three hybrids of cucumber were grown, namely AS1, AS2 and BF372, no significant difference was found in the chlorophyll content in the leaves between these hybrids. In a separate study, Sahoo (2014) evaluated five cucumber hybrids grown in protected environment, namely Isatish, Hilton, Alamgir-ct-180, Poona Khira and Himangi, and the results showed that Isatish hybrid had significantly higher leaf potassium percentage than Alamgir-ct-180, Poona Khira and Himangi hybrids. Al-Jubouri *et al.* (2017) conducted a study on three cucumber hybrids, namely H, P2 and P1, during spring and autumn seasons. The results showed that H hybrid had significantly higher leaf chlorophyll percentage than the other hybrids. In a study conducted by Al-Ibrahimi (2017) to evaluate four cucumber hybrids, namely Baraa 138, Rami, Sayff and Silyon, grown under the conditions of Thi Qar Governorate, the results showed that Rami and Silyon hybrids were significantly superior in leaf carbohydrate content compared to Sayff and Baraa hybrids. In addition, Baraa and Rami hybrids were significantly superior in leaf chlorophyll content compared to Sayff and Silyon hybrids.

### 3-1-3 Effect of hybrids on flowering growth parameters

In a study conducted by Al-Khadiri (2008), it was found that the two cucumber cultivars grown in plastic houses, Dine and Hybrid, were significantly superior in fruit set compared to the Hatem cultivar. However, the Hatem cultivar showed a significant superiority in the number of flowers compared to the other two cultivars. In a study conducted by Khan (2013) to evaluate six cucumber hybrids, namely Nun-3134, Kian, Isatis, Infinity, Nun-3121 and Nun-3141, it was observed that the hybrid Nun-3141 was significantly superior in the number of flowers per plant compared to the hybrid Infinity, while the hybrid Nun-3134 was significantly superior in the percentage of fruit set compared to the rest of the hybrids. In addition, Sarhan and Salih (2014) found that there was no significant difference in the number of flowers and set percentage of cucumbers grown in protected environment, namely Reem and Karol. In a study conducted by Sahoo (2014)



to evaluate five cucumber hybrids, namely Isatish, Hilton, Alamgir-ct-180, Poona Khira, Himangi, the results showed that Isatish hybrid was significantly superior in set percentage as compared to other hybrids. Pragathi (2014) conducted a study to evaluate nine cucumber hybrids, namely Don, Encounter-962, Indam-Swadisht-43, Kareena, Maharaja, Multi-Star, Sedona, Silyon, Vahini, the results showed that Silyon hybrid was significantly superior in number of flowers per plant as compared to Don hybrid. Kareena hybrid was also significantly superior in set percentage as compared to Don hybrid. In Yousefi's (2016) study, which investigated three cucumber hybrids, namely Saturn, 195, and 29, it was found that the hybrid Saturn achieved a significant increase in the number of flowers compared to the rest of the hybrids. In contrast, Ibrahim (2017) conducted a study on four hybrids of the same plant, namely Baraa 138, Rami, Sayff, and Silyon, where the hybrids Baraa 138, Rami, and Sayff were significantly superior in the number of flowers compared to the hybrid Silyon. The hybrid Baraa 138 also showed a significant superiority in the percentage of fruit set compared to the rest of the hybrids Rami, Sayff, and Silyon.

### 3-1-4 The effect of hybrids on quantitative and qualitative yield indicators.

In a study done by Al-Sahaf *et al.* (2011), three hybrids of cucumber were evaluated in the spring and autumn seasons, which are Ghazir, Najm and Babylon. The results showed that the hybrid Ghazir was significantly superior in number of fruits, average fruit weight, yield per plant, early yield and total yield compared to other hybrids. It was noted in an experiment conducted by Abdullah *et al.* (2012) when planting three hybrids of cucumber grown in plastic houses, namely Hadeel, Toshka and Shabah. The results showed that the hybrid Toshka was significantly superior in the trait of yield per plant, early yield and total yield with a significant difference from The rest of the hybrids show no variants. In a study done by Al-Habar *et al.* (2013) to evaluate the performance of seven female cucumber hybrid cultivars, namely: Summit, 276 Ameer, Grass, Baraa, Karol, Shadi, Laheeb, in spring and autumn seasons, the results showed that the hybrid cultivar Grass was significantly superior in fruit weight, number of fruits per plant, early yield, and total yield over the two seasons, compared to all other cultivars. In a study conducted by Al-Mohammadi and Al-Naif (2013) on two cucumber hybrids grown under protected cultivation conditions, namely Ryan and Sayff, during the 2012-2013 seasons, the researchers found that the hybrids did not show a significant effect on the number of fruits and yield per plant. Pragathi (2014) conducted a study to evaluate the performance of nine cucumber hybrids, namely: Don, Encounter-962, Indam-Swadisht-43, Kareena, Maharaja, Multi-Star, Sedona, Silyon, Vahini. The results showed that Multi-Star hybrid was significantly superior in per plant yield and total yield compared to Sedona hybrid. Don hybrid was significantly superior in fruit length and diameter compared to other hybrids and also superior in fruit weight compared to Multi-Star hybrid. Sahoo (2014) tested five cucumber hybrids: Isatish, Hilton, Alamgir-ct-180, Poona Khira, & Himangi. As compared to other hybrids, the Isatish hybrid beat those as far as of fruit length, average fruit weight, number of fruits per plant, per plant yield, and total yield. Mahmoud and Al-Rawi's (2015) study on four cucumber varieties, Sayff, Reem, Silyon, and Datis, found that the Datis variety beat Sayff and Reem in terms of fruit number The Silyon variety, on the other hand, beat other varieties in both fruit weight and length, and in total yield, while the Sayff variety bettered all others in total soluble solids. Ikenganyia *et al.* (2015) showed when three cucumber hybrids, Poinsett, Marketer, and Supermarketer, were planted, the Supermarketer hybrid produced much more fruit weight and a lot of fruits per plant as the other hybrids. Yousefi (2016) observed that the



three cucumber varieties, Saturn, 195, and 29, has little effect on yield metrics such as fruit length, diameter, and weight. Vina (2016) was a study on five cucumber varieties, namely BARAA 138, Dalia, Faris, Sayff, and Silyon RZ, noticing that the hybrid Silyon RZ has significantly greater yield per plant and total yield than the hybrid Dalia. Compared to the hybrid Dalia, the hybrid Faris grew a greater number and produced more fruits. The hybrid Dalia is a significantly bigger fruit diameter than the hybrid Faris. In the study of four cucumber hybrids, namely Pointsett-76, Marketer, Super-marketer, and Ashley, Adinde et al (2016) observed that the hybrid Pointsett-76 was far superior as far as of number of fruits, fruit weight, fresh fruit weight, and total yield (ton/ha-1). (2017) studied three cucumber hybrids: H, P2, and P1 for the spring and autumn seasons. The results showed that the hybrid H was significantly superior to the other hybrids in yield per plant, early yield, and total yield. Kumar *et al.* (2017) conducted a study to evaluate sixteen cucumber hybrids, namely Kafka, Dinamik, Fantasy, RS 03602833, Kian, KUK 9, Oscar, Valleystar, KUK 6, 52-23, Multistar, Y-225, JSCU 01, CBA 910569500, Ronino, and Pruva. The hybrid JSCU 01 beat the hybrid KUK 9 as far as in fruit length and weight as compared to all hybrids. The hybrid KUK 9 is significantly bigger fruit diameter as the hybrid CBA 910569500. The hybrid Multistar produces significantly more fruits per plant as the hybrid JSCU 01. The hybrid Valleystar had a significantly greater yield per plant compared to hybrids Kafka, Dinamik, Fantasy, JSCU 01, CBA 910569500, Ronino, and Pruva. Finally, the hybrid Oscar was a significantly greater total yields as the hybrids Kafka, Dinamik, Fantasy, KUK 6, Y-225, JSCU 01, CBA 910569500, Ronino, and Pruva. Hussein and Atallah (2017) found that the cultivation of two cucumber hybrids, Karima and Grass, showed that the Grass hybrid was significantly superior in fruit length, weight, number of fruits per plant, and yield per plant compared to the Karima hybrid. Chinatu et al (2017) in their study on seven cucumber hybrids, which were planted during the 2015-2016 seasons, namely Belt alpha, Point set, Market more, Regal, Unbeit, Zeina, and Ashley, found that the Regal hybrid was significantly superior in fruit weight compared to all hybrids, and in number of fruits and total yield (ton/ha-1) compared to the Belt alpha and Ashley hybrids. The results also showed that the Belt alpha hybrid was significantly superior in fruit length compared to the Point set, Zeina, and Ashley hybrids. In his study on four cucumber hybrids, namely Baraa 138, Rami, Sayff and Silyon, Al-Ibrahimi (2017) concluded that the hybrids Rami and Baraa 138 were significantly superior in the number of fruits. The hybrid Baraa 138 also showed a significant superiority in the yield per plant.

### 3-2-Organic matter

Optimal management of fertilizer use to achieve healthy production while preserving the ecosystem has been a major challenge in recent years. Increasing production to meet global food demand relies heavily on synthetic fertilizers, which leads to human health problems in addition to soil, water and air pollution. Hence, organic agriculture emerged as a solution to reduce these problems and ensure human and animal health (Adnan and Anjum, 2021).

The addition of fish manure significantly increased positive ions, with ammonium concentrations getting by 16-fold and potassium concentrations increasing by 35-fold, but the increase was only 28% due to the use of chemical fertilizers. Magnesium levels increased three times and calcium got 1.5fold. The rise in nutrient availability led to an increase in crop yields. In addition, fish waste fertilizer contributes support sustainable agriculture and the sustainability of the fish firm by



turning 30-70% of its waste into organic fertilizer, providing productive and environmental benefits to the agricultural sector Ahuja *et al.* (2020) Fish waste is an excellent fertilizer as it contains nutrients that crops need for growth, such as nitrogen, phosphorus, and potassium. In addition, calcium can be found in this waste and used to treat calcium-deficient soils. Jaies *et al.* (2024). Disposal of fish waste makes ecological problems in addition to disposal difficulties. As such, it is vital to find environmentally friendly ways of using this waste. Multiple research efforts have shown that fish waste contains an important amount of bioactive substances that can be was by and purified, such as bioactive peptides, oligosaccharides, fatty acids, enzymes, water-soluble minerals, and biopolymers. Geethanjai *et al.* (2020) Fish waste includes various parts like meat, shells, skin, viscera, bones, and liquid water. In other words, this waste includes an extensive variety of fish species or fishing parts of little or very low commercial value, such as small-sized or damaged commercial species, or those that do not migrate in enough quantities for sale (Caruso, 2016). It is believed that approximately two-thirds of fish are discarded as waste, resulting in significant environmental and economic impacts (Wu and Song, 2021). Due to their nutritional composition, fish waste can contribute to improving compost or providing nutrients to plants (Løes *et al.* (2018) Fish waste has traditionally been used as fertilizer due to its richness in nutrients, such as nitrogen and phosphorus, and its rapid decomposition. About 75% of the total weight of fish produces solid waste including intestines, head, skin, bones, fins and carcasses after processing. This waste is rich in nitrogen, potassium, phosphorus and trace minerals. Ghaly *et al.* (2013) & Radziemska *et al.* (2018) also studied the effect of fish waste-based fertilizers on vegetable growth and result. They did a pot experiment to look at the effect different fertilizers on snow lettuce (*Lactuca sativa* L.) creation as well as looking at the whole chemical composition and microelements.

### 3-2-1 Effect of organic matter on vegetative growth indicators

Staley *et al.* (2013) noted that organic fertilizers derived from the decomposition of fish waste are a natural stimulant that enhances the vegetative and root growth of horticultural plants, and are an effective alternative to chemical fertilizers. Several studies have indicated that the use of decomposed fish manure can provide a similar effect to chemical fertilizer NPK in increasing the dry and fresh weight of plants such as *Amaranthus hybridus*, *Solanum macrocarpon* (African eggplant), *Celosia argentea* (cockscomb), and *Vigna unguiculata* (cowpea). The results also showed that the levels of carotenoids increased significantly when fish organic fertilizer was added. Lema and Degebassa (2013) conducted an experiment using (fish waste fertilizers, inorganic fertilizers and non-decomposed fertilizers) on the growth and yield of tomato plants. The results showed that the use of fish waste fertilizers made a significant difference in the plant height compared to other fertilizers. After 30 days of planting tomato plants (*Solanum lycopersicum*), Rajasree and Aranganathan (2016) found that adding 5% and 10% liquid fish organic fertilizer led to a significant increase in plant height, in lengths reaches 50.8 cm and 54.29 cm, respectively. These results were far greater than conventional treatments and set fertilizer, which caused heights of 38.6 cm and 33.5 cm, respectively. Using 15% fish fertilizer resulted in a growth of around 50 leaves per plant, compared to only 33 leaves per plant in the recommended fertilizer treatments. Priyanka *et al.* (2019) showed that foliar spraying of fish amino acids from the decomposition of fish waste enhanced the vegetative growth of mung bean (*Vigna radiata*). Taking 1% of this fertilizer led to a plant height of 34.8 cm, while tiny plants were found in the control treatment at 28.0 cm. Mustafa *et al.* (2022) observed that the ground application of fish extract at a concentration of



(10 and 20) ml on the growth and yield of sweet pepper plants led to a significant increase in the trait of plant height at a concentration of 10 ml, which reached (35.33) cm, compared to a concentration of (20 and 0) ml, which reached (27.33 and 17.16) cm, respectively. Karo and marpaung (2020) showed that Adding fish fertilizers to leek plants at a rate of 1000 kg/ha led to an increase in plant height. In an experiment conducted by (2023) sutriana et al. in adding different levels of river fish waste (0, 5, 22, 45, 67.5, 90) ml to leek plant growth, the concentration of 90-67.5 ml of fish waste achieved a significant increase in plant height, number of leaves, tuber formation age, wet tuber weight and dry tuber weight. Pakeerathan *et al.* (2023) found that using fish emulsion in conjunction with other organic fertilizers improved the vegetative and root growth of marigold (*Amaranthus viridis L.*) When using fish emulsion with Vermicompost extract, the highest average growth parameters were recorded, as the leaf area reached 17.3 cm, plant height 27.13 cm, and root length 19.95 cm. In addition, there was a significant increase in the fresh and dry weight of the plant, where the fresh weight reached 4.92 g and the dry weight 1.63 g, while the number of leaves reached 11.25 leaves per plant. Ramesh *et al.* (2020) noted that spraying cucumber plants with fish amino acids at different concentrations (4%, 3%, 2%, 1%, 0.5) ml. L<sup>-1</sup>. The concentration of 2% caused a significant increase in the chlorophyll content, which reached (26.5, 26.10) compared to the rest of the concentrations.

### 3-2-2 Effect of organic matter on the chemical components of leaves

Mazur and Radziemska (2014) in an experiment of growing radish (*Raphanus sativus*) in Sinadin, used organic fertilizer consisting of different materials, where fish waste constituted 80% of its composition. The results showed that the average leaf content of nutrients such as phosphorus (P), potassium (K), calcium (Ca), and sodium (Na) was significantly higher in all treatments that used organic fertilizer compared to those that used mineral fertilizer. Shahsavani *et al.* ,(2017) when comparing chemical fertilizers, the addition of fish waste showed a significant effect in improving the quality of cowpea (*Vigna unguiculata*) seeds grown in greenhouses. This addition led to a significant increase in the levels of protein and phosphorus in the seeds. In another study conducted by Radziemska *et al.* (2019) to evaluate the effectiveness of fertilizers extracted from fish waste decomposition in agriculture, it was observed that adding this fertilizer to the soil of agricultural anvils led to a significant increase in the macronutrients in the leaves of snow lettuce (*Lactuca sativa L.*). The levels of nitrogen increased by 78.6%, phosphorus by 61.8%, and potassium by 56.3%. In addition, the content of micronutrients was also enhanced. Hussein and Ahmed (2020) observed that when different levels of fish oil 3, 2, and 1 ml/L were sprayed on potato plants, the results showed a significant difference in the percentage of nitrogen in potato leaves at the level of 2 ml/L, which reached (2.91%) and (2.87%) for the two seasons, respectively, compared to other treatments. Unggang *et al.* (2023) observed that the ground application of fish meal fertilizers on the growth of spinach plants led to an increase in the percentage of nitrogen in spinach leaves. Alawi and Drifl (2016) reported that spraying cucumber plants grown in a plastic house with the organic nutrient Slaptoniol 2 at a concentration of 2 ml/L, three times; the first after 12 days of transplanting, and the second and third with an interval of 21 days between each spray, led to a significant increase in the total chlorophyll content of the leaves. However, the spraying did not significantly affect the nitrogen and phosphorus content of the leaves, while it caused a significant decrease in their potassium content compared to the control treatment.



### 3-2-3 Effect of organic matter on floral growth indicators

Hamza *et al.* (2010) indicated when they used four different concentrations of organic fertilizer on cucumber plants in a greenhouse in central Iraq, namely 4.0, 5.0, 6.0, and 7.0 ml/L, that the concentration of 6.0 ml/L achieved a significant increase in the number of flowers and the percentage of fruit set. In Shafeek *et al.* (2016) used two methods to add humic acid to Pracodo hybrid cucumber plants grown in a plastic house, namely foliar spraying and addition to the soil, at four levels for each (0, 3, 6, and 9 L/acre). The results showed that the concentration of 9 L/acre for both methods led to a significant increase in the number of flowers during both seasons. In a study conducted by Buang *et al.*, (2018) when adding fish waste extract to cucumber plants at several concentrations (50, 40, 20, 10) ml in addition to the comparison treatment, the results showed that the concentration of 20 ml led to a significant increase in the number of flowers, number of fruits, and fruit weight compared to other concentrations. Abusaief and Bulsod (2021) noted in a study that adding fertilizers with fish extract to flax plants led to an increase in grain and oil production and fiber content of flax plants.

### 3-2-4 Effect of organic matter on quantitative and qualitative yield

indicators In a study conducted by Castro *et al.*, (2006) The ground addition of liquid fish extract to the growth of cherry tomato plants led to an increase in the number of fruits and an increase in the yield of the plant. Sanwal *et al.* (2006). reported that the application of the aqueous extract resulting from anaerobic organic fertilizer waste led to an increase in crop production and improved the levels of nutritional antioxidants in broccoli plants. In an experiment conducted by Fahlivi, (2015) the ground addition of liquid fertilizer from fish guts to onion and garlic plants caused an increase in the productivity rate and plant height. In another study conducted by llera *et al.*, (2015) using different fertilizers, namely marine wood fertilizers + fish waste, mackerel fish fertilizer and pine bark fertilizer, on the growth and yield of tomato plants, where fish waste fertilizer achieved a significant difference in the crop compared to other fertilizers.

The importance of organic fertilizers is to enhance the quality of fresh vegetable crops after harvest Nurhidayati and Murwani, (2017). Elkharafen *et al.* (2018) noted that adding fish waste to peach trees led to an increase in the quantitative yield of peach trees. Kaab (2019) also found that irrigation with fish farm water on basil plants led to a significant increase in the fresh and dry weight of the vegetative and root system, the number of leaves, and the height of the stem compared to irrigation with river water. In a study conducted by Abdelghany ,(2024) when spraying different levels of fish fertilizer (0.5 and 1.5) ml/L on pomegranate plants, the level of 1.5 ml/L caused an increase in fruits, grains, peel weight, juice volume, and dissolved solids.

### 3-3 Storability

#### 3-3-1 Percentage of weight loss%



Fruits lose their water content through transpiration and respiration, whether they are still attached to the plant or after harvest. When the fruits are attached to the mother plant, this loss can be compensated for by absorbing water from the plant. However, after harvest, water loss becomes a major problem, as even a small loss in weight leads to the fruits wrinkling and wilting, causing a significant loss (Al-Ani, 1985). Weight loss occurs either due to water evaporation from the surface of the fruits, or as a result of the consumption of the fruit's food reserves through respiration, or as a result of both reasons.

In a study conducted by Jasim *et al.* (1991) on green sweet pepper fruits of the "California Wonder" variety, the fruits were treated with different concentrations of calcium chloride (0, 1000, 3000, 5000 ppm) and stored at 5 and 10 °C for 20 days, with the quality of the fruits evaluated every five days. The researchers observed that weight loss was less in fruits stored at 5 °C than in those stored at 10 °C, regardless of the calcium chloride concentration used. In an experiment conducted by Ashtari, (2004) on the "Shahmiveh" pear variety, the fruits were harvested in the early morning during July and August. The fruits were divided into two groups: one treated with 100% calcium chloride and the other with 2% calcium chloride with 100 ppm chlorine. When the fruits were left at 2 °C, weight loss fell by 30-40% in both groups compared to non-calcium-treated fruits, which lose the most weight. Grey *et al.* (2007) found significant differences in weight loss rates in five tomato cultivars: Hatouf F1, Rio F1, Douna F1, Primato F1, and Super MamandePrimato F1 was the lowest weight loss rate, with no significant difference between it and Super mamande, however significant differences were noted if compared to the other cultivars. The study also found that Primato F1 had the lowest spoiled rate, that distinct significantly from all of the other cultivars. Taain *et al.* (2007) showed that weight loss in okra fruits of the Khneissri cultivar increased with time in storage, peak at 13.76% after 12 days at 10±1°C.

### 3-3-2 Percentage of damage (%)

Fruits are resistant to damage while in storage, and damage of all kinds is one of the most significant problems the fruits face after harvest. Mechanical damage, physiological damage, and infection by microorganisms such as fungi, bacteria, and yeasts, which attack fruits after picking, and also during storage and marketing, is the worst types of damage. It has been noted that temperature has a crucial role in determining the amount of damage; as refrigerated storage at low temperatures helps to avoid damage significantly, per to studies. (Al-Ani, 1985; Dementeva, 1988; and Vegonski). A study done by (Panwer, 1982) shown that temperature and duration of storage was an impact on the rate of damage in fruits. The level of damage increases at higher temperatures and time in storage. Fruits are subject to decline both before and after storage. Spoilage due to mechanical, physiological, and microbe damage is considered the most important a problem for fruits after harvest. according to (Al-Ani, 1985). Tain *et al.* (2007) The study revealed that as Super Marimmond tomato fruits were stored at 5±2°C over 21 days, the spoiling rate increased to 12.2%. The study found that fungal infections were the most common cause of loss, with many fungi found, such *Aspergillus niger* and *Penicillium italicum*.

### 3-3-3 Total soluble solids (T.S.S).



Fruits lose water content as still on the plant or after harvest. When the fruits are tied to the mother plant, this loss is easily offset. However, after harvest, water loss is a major problem since it causes the fruits to wilt and wrinkle, lower their market value greatly. Fruits reaching this point of irritation can pose an important loss to farmers and traders, so saving the water content after harvest is vital for ensure the quality and marketability of the fruits. Al Ani (1985) Fruit water content is seen as one of the more significant factors in keeping quality all through storage. When fruits lose water, their cell turgor pressure drops, and they wilt. Weight loss occurs either as a result of water evaporation from the surface of the fruit or the consumption of food reserves during the respiration process, or as a result of both factors together (Shirokvo, 1988). In a study conducted by Taain *et al.* (2015) on the storage capacity of jujube fruits of the Taffahi variety at a temperature of 0±1°C in a refrigerated incubator for five weeks, the results showed that total soluble solids increased with the length of the storage period, recording their highest value of 21.24% after five weeks.

**Table (1) Some chemical and physical properties of field soil and irrigation water for the 2008/2009 season**

Indicator	Value
( E.C) Dsm <sup>-1</sup>	4.06
(PH)	7.50
Total N mg l <sup>-1</sup>	1.85
Total P mg l <sup>-1</sup>	33.48
Total K mg l <sup>-1</sup>	17.39
Na mg l <sup>-1</sup>	169.60
Total Ca mg l <sup>-1</sup>	1120
Organic Matter%	0.29
<b>% Soil separations</b>	
Sand	80.732
Silt	14.752
Clay	4.516
Soil texture	Sandy mix
<b>Irrigation water</b>	
( E.C)Dsm <sup>-1</sup>	3.40
(PH)	7.00

#### 4-Results and Discussion

Table (2) clearly shows the variety has a significant effect, as Shadi variety plants performed in all rated vegetative indicators of development except the total number of leaves per plant, as the two varieties did not differ significantly in this trait, while Shadi variety plants outperformed with an increase rate of (4.29, 13.48, 24.39, 6.31, 11.36)% in plant height, stem diameter, fresh weight of the plant, dry weight of the plant, and percentage of moisture in the plant compared to Saif



variety plants, respectively. This may be due to the genetic factors specific to the variety and its response to environmental factors.

It also appears from the same table that spray treatments had a significant effect on all studied vegetative growth indicators except for the total number of leaves and dry weight of the plant. Spraying with calcium chloride at a concentration of 3% caused a significant increase in the fresh weight of the plant, with an increase rate of 14.73% compared to the control treatment (distilled water only). This may be attributed to the fact that spraying plants with the appropriate concentration of calcium will activate many enzymes and contribute to the continuation of meristematic cell division and to the regulation of most stages of plant growth and development, as it is considered a secondary messenger in the plant's response to plant hormones (poovaiah, 1993; Hopkins, 1999). This is reflected positively in an increase in the plant's fresh weight, but spraying with calcium chloride at 1% concentration led to a significant decrease in plant height and stem diameter as compared to the other spray treatments. In lieu of the other spray treatments, spraying with calcium chloride at a concentration of 2% led to a significant decrease in moisture.

The table shows that the interaction between the two study factors had a significant effect on all the studied vegetative growth indicators except for the total number of leaves per plant. The untreated Shadi cultivar plants were significantly superior in plant height, giving The highest height of 212.8 cm, while the Saif cultivar plants given 1% calcium chloride had the lowest height of 170.7 cm. The Saif cultivar plants sprayed with calcium chloride concentration 2% are significantly larger in stem diameter, giving an optimal diameter of 8.26 mm, while the Saif cultivar plants given calcium chloride concentration 3% gave a smallest diameter of 6.43 mm.. While the Shadi cultivar plants gave with a calcium chloride concentration of 3% were significantly better in terms of fresh and dry weight, giving The greatest amount of weight was 66.66,262.1 grams, respectively, while the plants of the Saif variety sprayed with calcium chloride concentration 2% gave the lowest fresh weight, which was 160.5 gm. 3% gave the lowest dry weight of the plant, which was 55.43 gm. As for the percentage of moisture, the plants of the Saif variety sprayed with calcium chloride concentration 3% were superior, “significantly”, as they gave the highest percentage, which was 76.78%, while the plants of the Saif variety sprayed with calcium chloride concentration 2% gave the lowest percentage, which was 65.04%.

**Table (2) The effect of spraying with calcium chloride on some vegetative growth indicators of the two hybrid cucumber varieties ((Saif and Shadi)) grown in the plastic house**

Variety	Calcium chloride concentrations %	Plant height (cm)	stem diameter (mm)	Total number of leaves/plant	Fresh weight of plant (g)	Dry weight of plant (g)	Humidity % percentage
Saif	0	187.5	7.40	35.53	197.6	55.50	69.09



	1	170.7	7.03	37.67	225.9	56.17	75.13
	2	181.4	8.26	36.53	160.5	57.11	65.04
	3	185.7	6.43	35.27	239.2	55.43	76.78
Shadi	0	212.8	8.10	37.13	257.40	63.99	75.13
	1	180.3	7.40	35.00	243.60	61.69	74.67
	2	210.1	7.30	37.40	238.60	62.08	73.98
	3	204.4	8.16	36.60	262.10	66.66	74.56
The least significant difference at the 0.05 significance level for the interaction		29.87	0.07	No	43.58	6.28	6.01
Average effect Saif		181.3	7.28	36.25	201.3	56.05	71.51
Variety Shady		201.9	7.74	36.53	250.4	63.61	74.58
The least significant difference at a significance level of 0.05 for the variety		14.93	0.03	No	21.79	3.14	3.00
Average effect 0		200.1	7.75	36.33	218.5	59.74	72.11
Clويد concentrations 1		175.5	7.21	36.33	234.8	58.93	74.90
Calcium 2		195.8	7.78	36.97	199.5	59.60	69.51
3		195.1	7.30	35.93	250.7	61.05	75.67
Least significant difference at 0.05 significance level for concentrations		21.12	0.05	No	30.81	No	4.01

Table (3) shows that the variety has significant effects on the two traits of the average weight of a single fruit and early productivity only, as the fruits of the Shadi variety were significantly superior in average weight of the fruit and by an increase rate of 15.25% compared to the fruits of the Saif variety, while the opposite occurred in early productivity, as the Saif variety plants were significantly superior and by an increase rate of 16.04% compared to the Shadi variety plants. The difference between the two kinds may be tracked to the variety's genes and to the total that it acts to environmental factors. The same info shows that spraying treatments only had an important effect on two traits: early and final product. Early productivity decreased significantly when spraying with calcium chloride concentrations of 1 and 2% compared to the control treatment and spraying with a concentration of 3%, while spraying with a concentration of 3% caused a significant increase in total productivity compared to the control treatment and concentrations of 1 and 2%, with an increase rate of (20.0, 33.89, 30.32)%, respectively. We may attribute the increase in yield to the activity of some enzymes as a result of spraying with the appropriate concentration of calcium chloride, which led to increased cell division and increased rate of photosynthesis. This result is consistent with what was found by (Lieng *et al*, 2008).

It is noted from the same table that the interaction between the two study factors showed a significant effect on all studied yield traits, as the untreated Shadi cultivar plants outperformed, giving the largest number of fruits, reaching 28.40, and the highest average fruit weight, reaching 146.3 g, while the Shadi cultivar plants sprayed with calcium chloride at a concentration of 1% gave the lowest number, reaching 21.60 fruits, and the Saif cultivar plants sprayed with calcium chloride at a concentration of 1% gave the lowest average fruit weight, reaching 112.4 g. While the Saif cultivar plants sprayed with calcium chloride at a concentration of 3% gave the highest early and total productivity, reaching 0.613 and 4.057 tons/plastic house, respectively, while the Shadi cultivar plants sprayed with calcium chloride at a concentration of 1% gave The lowest early productivity was 0.350 (tons/greenhouse), and the plants of the Saif variety sprayed with calcium chloride at a concentration of 2% had the lowest total productivity, reaching 2.358 tons/greenhouse.

**Table (3) The effect of spraying with calcium chloride on some quantitative yield characteristics of the two hybrid cucumber varieties ((Saif and Shadi)) grown in the plastic house.**

Variety	Calcium chloride % concentrations	Number of fruits/plant	Average weight of one fruit (g)	Early productivity (ton/greenhouse)	Total productivity (tons/greenhouse)
Saif	0	26.66	124.3	0.558	2.565
	1	28.00	112.4	0.461	2.644
	2	24.54	113.3	0.479	2.358
	3	22.14	114.3	0.613	4.057
Shadi	0	28.40	146.3	0.465	3.064
	1	21.60	127.2	0.350	2.402
	2	25.60	145.0	0.471	2.827
	3	25.86	116.7	0.536	2.714



The least significant difference at the 0.05 significance level for the interaction	5.25	32.6	0.102	0.517
Average effect Saif	25.43	116.1	0.528	2.906
Shady Variety	25.36	133.8	0.455	2.748
The least significant difference at a significance level of 0.05 for the variety	No	16.3	0.051	No
Average effect 0	27.54	135.3	0.510	2.815
Clold concentrations 1	24.80	119.8	0.405	2.523
Calcium 2	25.06	129.1	0.475	2.592
3	24.00	115.5	0.575	3.378
Least significant difference at 0.05 significance level for concentrations	No	No	0.072	0.366

Table (4) shows the variety has an important effect on the crop's qualitative characteristics., except for the percentage of total soluble solids in the fruits. The fruits of the Shadi variety were significantly superior in the amount of vitamin C, the percentage of potassium ions penetrating the fruits, and their calcium content compared to the fruits of the Saif variety. This difference may be attributed to genetic factors. The calcium chloride spray treatments showed a significant effect on the two characteristics of the percentage of potassium ions penetrating the fruits and the calcium content of the fruits only, as the percentage of potassium ions penetrating the fruits decreased significantly in the spray treatment compared to the control treatment, and the decrease gradually increased with increasing the concentration of calcium chloride spray, which indicates that the spray treatments preserved the fruit cell membranes, which led to extending the life of the fruits by retaining the cell membranes for the longest possible period. This is consistent with Bakr and Gawish (1993), while the calcium chloride spray treatments caused A significant increase in the calcium content of the fruits compared to the comparison treatment, and the effect increases with increasing the spray concentration. It appears from the same table that the interaction between the two study factors has had a significant effect on all the qualitative characteristics studied, except for the characteristic of the percentage of total soluble solids. The fruits of the Shadi variety sprayed with calcium chloride concentration 2% were significantly superior in the amount of vitamin C in them, as they gave the largest amount of 11.52 mg/100 g fresh weight, while the fruits of the untreated Saif variety gave the lowest amount of 8.53 mg/100 g fresh weight. Also, the fruits of the Saif variety sprayed with calcium chloride concentration 3% gave the lowest percentage of potassium ions penetrating the fruits, reaching 24.79%, while they gave The fruits of the untreated Saif variety had the highest



percentage, reaching 39.77%. The fruits of the Shadi variety, sprayed with calcium chloride at a concentration of 3%, gave the highest calcium content in the fruits, reaching 63.10 mg/g, while the fruits of the untreated Saif variety gave the lowest content, reaching 12.21 mg/g.

**Table (4) The effect of spraying with calcium chloride on some qualitative characteristics of the two hybrid cucumber varieties ((Saif and Shadi)) grown in the plastic house.**

verity	Calcium chloride concentration %	Amount of Vitamin C (mg/100g fresh weight)	percentage of total dissolved solids	Percentage of potassium ions penetrating the fruits	Calcium content of fruits (mg/g)
Saif	0	8.53	4.33	39.77	12.21
	1	8.75	4.00	33.30	20.69
	2	8.75	4.67	31.45	30.81
	3	10.99	5.00	24.79	40.99
Shadi	0	10.24	4.67	39.01	14.30
	1	10.77	4.67	35.64	24.69
	2	11.52	4.83	33.45	43.38
	3	11.20	4.83	34.13	63.10
The least significant difference at the significance level of 0.05 for the interaction		2.54	No	4.42	2.59
Average saif impact		9.25	4.50	32.33	26.17
Shady variety		10.93	4.75	35.56	36.37
The least significant difference at a significance level of 0.05 for the variety		1.27	No	2.21	1.29
Average effect 0		9.39	4.50	39.39	13.25
Clويد concentrations 1		9.76	4.33	34.47	22.69
Calcium 2		10.13	4.75	32.45	37.09
3		11.09	4.92	29.46	52.05
Least significant difference at 0.05 significance level for concentrations		No	No	3.12	1.83

## 5-Conclusions

We conclude from this study that spraying cucumber plants with calcium chloride at a concentration of 3% at the stage of 4-5 true leaves improved the vegetative growth and the quantitative and qualitative yield of cucumber plants grown inside plastic houses.

## III. References

- Abdelghany, A. M. M. (2024). Biostimulants and their impact on growth and fruit quality of pomegranate trees via foliar spray. \*Agric. & Env. Sci. (Damanhour University)\*, 23, 170-191.
- Abdel-Mageed, Y. T., Tantawey, I. A. A., & Stouhy, M. Mai. (2024). Effect of mulching and different rates of compost on growth and production of three cucumber hybrids. \*Minia Journal of Agricultural Research\*, 44, 97-120.
- Abdul Rahman, Harith Burhanuddin, Ghassan Jaid Zidane and Qutaiba Yasser Ayed (2013). Effect of spraying with nutrient solutions on the quantitative and qualitative yield of two cucumber hybrids, Diyala Journal of Agricultural Sciences, 122:(2)5:132-132.
- Abdullah, Abdullah Abdul Aziz, Makki Hussein Ali Al-Momen and Basem Yassin Marzouq. (2012). Evaluation of some cucumber hybrids grown in plastic houses in southern Iraq. Thi Qar University Scientific Journal. 7(3): 1-9.
- Abdullah, Abdullah Abdul Aziz, Makki Hussein Ami Al-Momen and Basem Yassin Marzouq. (2012). Evaluation of some cucumber hybrids grown inside plastic houses in southern Iraq. Thi Qar University Scientific Journal. 7(3):1-9.
- Abusaief, H.M.A., Alhaddad, A., & Bulsod, N.B.O. (2021). Study on bio-fish extract and cultivation dates to improve production of flax (*Linum usitatissimum*) in Omar-Mukhtar area, Libya. \*Journal Name\*, 22, 536-548.
- Adinde, J.O.; U.J. Anieke.; O.J., Uche; .A.C.Aniakor;L.C.Isani and A.A.Nwagboso (2016). Assessment of performance of four cucumber (*Cucumis sativus* L.) cultivars in iwollo, southeastern Nigeria.Int.J. Curr.Res. Bio. sci. plant Biol.3(10):136-143.
- Adnan, M., & Anjum M. Z. (2021). Back to Past; Organic Agriculture. Acta Sci. Agri. 5(2), 01-02.
- Ahuja, I., Dauksas, E., Remme, J. F., Richardsen, R., & Løes, A. K. (2020). Fish and fish waste-based fertilizers in organic farming-With status in Norway: A review. Waste Management, 115, 95-112.
- Al-Ani, Abdul-Ilah Mukhlef (1985). Physiology of horticultural crops after harvest. Ministry of Higher Education and Scientific Research, Iraq
- Al-Ani, Abdul-Ilah Mukhlef (1985). Physiology of horticultural crops after harvest. Ministry of Higher Education and Scientific Research. Iraq.
- Alawi, Mohammed Mustafa and Khaled Abdul Hussein Drifel (2016) The role of biofertilizer and spraying with some nutrients in the growth and yield of cucumber grown under protected environment conditions, Al-Furat Journal of Agricultural Sciences, 138-8.
- Al-Bayati, H. J. M. (2020). Effect of organic and inorganic fertilizers on growth and yield of hybrid cucumber *Cucumis sativus* L. grown under unheated plastic house. \*1st Scientific International Virtual Agricultural Conference\*, 10, 1755-1315.
- Al-Bayati, H. J. M., Al-Harbawy, K. A. M., Allela, W. B. A., Al-Sabawy, M. M. S., Ibraheem, F. F. R., Al-Taey, D. K. A., & Mahmood, S. S. (2023). Response growth and yield of three cucumber hybrids (*Cucumis sativus* L.) to nano fertilizer N20P20K20 under protected house. \*Earth and Environmental Science\*, 10, 1755-1315.
- Al-Bayati, Hassan Jawad Moharram and Tara Janan Kamel (2014). Improving the growth and yield of two varieties of female cucumber (*Cucumis sativas* L.) by covering the soil and adding organic fertilizers under unheated plastic house conditions. Journal of Agricultural Sciences. 7 (4): 22-9



- Al-Habar, Mohammed Talal Abdul Salam and Hussein Jawad Muharram Al-Bayati and Walid Badr Al-Din Al-Layla (2013). Evaluation of some hybrid female cucumber F1 (*Cucumis sativus* L.) cultivars grown under unheated plastic house conditions in Mosul city. *Iraqi Journal of Agriculture, Rafidain* 41(3): 65-72.
- Al-Ibrahimi, Ahmed Mahdi Saleh (2017) The effect of the breeding method on the growth, yield and storage capacity of some cucumber hybrids (*Cucumis sativus* L.) grown in plastic houses. Master's thesis. College of Agriculture. University of Basra.
- Al-Ibrahimi, Ahmed Mahdi Saleh (2017). Effect of breeding method on growth, yield and storage capacity of some cucumber hybrids (*Cucumis sativus* L.) grown in plastic house. Master's thesis. College of Agriculture. University of Basra.
- Al-Ibrahimi, Ahmed Mahdi Saleh (2017). Effect of breeding method on growth, yield and storage capacity of some cucumber hybrids (*Cucumis sativus* L.) grown in plastic houses. Master thesis. College of Agriculture. University of Basra.
- Al-Ibrahimi, Ahmed Mahdi Saleh (2017). The effect of the breeding method on the growth, yield and storage capacity of some cucumber hybrids (*Cucumis sativus* L.) grown in a plastic house. Master's thesis. College of Agriculture. University of Basra.
- Al-Jubouri, Kazem Dili Hassan, Hadi Mahdi Abboud and Faleh Hassan Saeed (2017). Effect of biofertilizers and genetic compositions on the growth and production of cucumber (*Cucumis sativus* L.). *Anbar Journal of Agricultural Sciences*, 15 Special Issue (308-317).
- Al-Jubouri, Kazem Dili Hassan, Hadi Mahdi Abboud and Faleh Hassan Saeed (2017). Effect of biofertilizers and genetic compositions on the growth and production of cucumber (*Cucumis sativus* L.). *Al-Anbar Journal of Agricultural Sciences*, 15 Special Issue (308-317).
- Al-Khudairi, Khaled bin Eidan Surur (2008). Effects of fertilization with triple superphosphate fertilizer on growth, yield and quality characteristics of some cucumber varieties under water stress conditions. Master's thesis, King Abdulaziz University, Kingdom of Saudi Arabia.
- Al-Mohammadi, Saad Abdul Wahid Mahmoud and Liqaa Hikmat Nafie Al-Naif (2013). Response of two cucumber hybrids to different types of fertilizers and magnetic irrigation under protected cultivation conditions. *Karbala University Scientific Journal*, 11(4): 77-88.
- Al-Muhammadi, Saad Abdul Wahid Mahmoud and Liqaa Hikmat Nafie Al-Naif (2013), Response of two hybrids of cucumber of different types to fertilizers and magnetic irrigation under protected cultivation conditions. *Karbala University Scientific Journal*, 11(4):77-88.
- Al-Mutawwari, Aqila Juma Hajim (2010). Effect of calcium on the growth and yield of two hybrid cucumber varieties grown in plastic greenhouses and its effect and storage temperature on storability. Master's thesis, Department of Horticulture and Landscape Engineering, College of Agriculture, University of Basra, Iraq.
- Al-Rawi, Khashe' Mahmoud and Abdul Aziz Mohammed Khalaf Allah (1980). Design and Analysis of Agricultural Experiments, Dar Al-Kutub Printing and Publishing Foundation - University of Mosul - Iraq.
- Al-Sahaf; Fadhel Hussein and Mohammed Zidan Al-Muharib and Firas Mahmoud Jawad (2011). Response of cucumber varieties to chemical and organic fertilizers. *Iraqi Journal of Agricultural Sciences*. 42(4): 52-62.
- Al-Shammari, Aziz Mahdi Abdul and Omar Ghazi Yahya Saud (2013). Effect of spraying with some organic nutrients and breeding method on the growth and yield of three cucumber hybrids (*Cucumis sativus* L.) under protected cultivation conditions. *Diyala Journal of Agricultural Sciences*, 5:283-294:(2).
- Al-Shammari, Aziz Mahdi Abdul and Omar Ghazi Yahya Saud (2013). The effect of spraying with some organic nutrients and the breeding method on the growth and yield of three cucumber hybrids under protected cultivation conditions. *Diyala Journal of Agricultural Sciences* 5 (2): 283-294
- Aranganathan, L., & Rajasree SR, R. (2016). Bioconversion of marine trash fish (MTF) to organic liquid fertilizer for effective solid waste management and its efficacy on Tomato growth. *Management of Environmental Quality: An International Journal*, 27(1), 93-103
- Ashtari, A. K.(2004). Effect of postharvest pre-cooling processes and cyclical heat treatment on the physico-chemical properties of "Red Haven peaches"and "Shahmiveh pear" during cold storage. *J. Food. Safety*, 5:24-34
- Baker,A.A. and R.A.Gawish (1993).Technological aspects of keeping and picking qualities of cucumbers as influenced by fertilizers. *journal of and Foods for-Human nutrition* 44(1):17-28. Plant



- Bangerth, F.; D.R. Dilly and P.H. Dewey (1972). Effect of post harvest calcium treatments on internal break down and respiration of apple fruits. J. Amer
- Buang Ellyzatul, A., Yusoff, N., Mat, N., & Khandaker, M. M. (2018). Effects of fish waste extract on the growth, yield and quality of \*Cucumis sativus\* L. \*Agrobiotech\*, 9, 250-259.
- Caruso G (2016) Fishery wastes and by-products: A resource to be valorised. J Fish Sci 10(1):0-0
- Castro, R. S., Azevedo, C. M. S. B., & Bezerra-Neto, F. (2006). Increasing cherry tomato yield using fish effluent as irrigation water in Northeast Brazil. \*Journal Name\*, 110, 44-50.
- Chikezie O. E.; E.O. Peter; U.A. Christian and P.C. Uche (2016). Evaluation of sixteen Cucumber (*Cucumis sativus* L.) genotypes in derived savannah environment using path coefficient analysis. Not Sci Biol., 8(1):85-92.
- Chinatu, L.N., O. Henry, and C.B. Okoronkwo, (2017). Assessment of yield and yield components of cucumber (*Cucumis sativus* L.) in southeastern Nigeria. International Journal of Agriculture and Earth Science, 3(1):2481-2489.
- Dementeva, M.E. and M.E. Vegonski (1988). Disases of fruits, vegetables and potatoes during storage. Moscow. 231pp.
- Ehiokhilen K. E. and U.R. Samson (2010). Growth and yield of cucumber (*Cucumis sativus* L.) as influenced by farm yard manure and inorganic fertilizer. J. Plant Breeding and Crop Sci., 2(4): 1-6
- El-Kharafen, A. S., El-Alakmy, H. A., Ahmed, R. B., Sourour, M. M., & El-Deeb, M. D. (2018). The use of some organic and bio-fertilizers for Earligrande peach trees fertilization under North Sinai conditions. \*SINAI Journal of Applied Sciences\*, 7, 2314-6079.
- Fahlivi, M. R. (2015). Physicochemical characteristics of liquid fertilizer from fish viscera.
- Food and Agriculture Organization of the United Nations (FAO) (2009) . Faostat. [Http://Fastat.Fao.Org/Site/567/Desktopdefault.aspx?Pageid=567#Anchor](http://Fastat.Fao.Org/Site/567/Desktopdefault.aspx?Pageid=567#Anchor)
- Geethanjali, S., Subash, A., Govindan, K., Pandiyan, M., & Paramasivam, V. (2020). An overview of fish visceral waste pollution and its eco-friendly management practices. \*International Journal of Chemical Studies\*, 5, 19-26.
- Ghaly, A. E., Ramakrishnan, V. V., Brooks, M. S., Budge, S. M., & Dave, D. (2013). Fish Processing Wastes as a Potential Source of Proteins. Amino Acids and Oils: A Critical Review, Journal of Microbial Biochemistry and Technology 5(4): 107-129
- Hamza, Musa Mohammed, Hassan Alwan Salman and Omar Hamid Obaid (2010). Effect of number of spraying times and level of Humus soil fertilizer on growth and yield of cucumber (*Cucumis sativus* L.) grown in greenhouse. Al-Furat Journal of Agricultural Sciences (12) 24-28.
- Hassan and Man Saleh (2020) The effect of soils previously planted with leguminous crops on the plant and growth of two cucumber varieties. Al-Rafidain Scientific Journal (29(2):11-19
- Hassan, Ahmed Abdel Moneim (2017). Plant Breeding Series. General Principles of Plant Breeding. Arab House for Publishing and Distribution. Faculty of Agriculture. Cairo University. 85 pp.
- Hemant K. S. and A. Tiwari. (2018): Exploitation of heterosis for yield and contributing traits in cucumber (*Cucumis sativus* L.) J of Pharm and Phyto 7 (3): 395-397.
- Hopkins, W.G. (1999). Introduction to plant physiology . John Willy and Inc. 2<sup>nd</sup> edition.
- Hussein, Hiba Ali and Hakim Shamran Atallah (2017) The effect of spraying with foliar fertilizer Qol Spray on the growth and yield of two cucumber hybrids grown in unheated plastic houses, Al-Furat Journal of Agricultural Sciences (1) 39-48.
- Hussein, Hiba Ali and Hakim Shamran Atallah (2017). Effect of spraying with foliar fertilizer Fol Spray on the growth and yield of two hybrid cucumbers grown in unheated plastic greenhouses under the influence of some agricultural treatments, Al-Furat Journal of Agricultural Sciences 9(4).
- Hussein, Hiba Ali and Hakim Shamran Atallah (2017). Effect of spraying with foliar fertilizer Fol Spray on the growth and yield of two hybrids of cucumber grown in unheated plastic houses, Al-Furat Journal of Agricultural Sciences 9(1) 39-48.
- Hussein, W. A., & Ahmed, N. E. (2020). Growth and yield of potato in relation to application of Alphylax and fish oil as organic fertilizers. \*EurAsian Journal of BioSciences\*, 14, 374-378.
- Ikenganyia, E. E, U. M. Ndubuaku, C. C. Onyeonagu and I. N. Dimelu (2015) . Performance of three varieties of Cucumber (*Cucumis sativus*) in composted rice husks plus poultry manure media and the effects on soil nutrient status. International Journal of Plant & Soil Science. 5(3): 167-174
- Illera-Vives, M., Seoane Labandeira, S., Brito, L.M., López-Fabal, A., & López-Mosquera, M.E. (2015). Evaluation of compost from seaweed and fish waste as a fertilizer for horticultural use. \*Scientia Horticulturae\*, 186, 101-107.
- Jaies, I., Qayoom, I., Saba, F., & Khan, S. (2024). Fish wastes as source of fertilizers and manures.



- Jari, Awatif Nima Jari, Hamid Abdul Karim Abdul Wahid and Diaa Ahmed Tain (2007). Study of the storage capacity of five varieties of tomato *Lycopersicon esculentum* Mill grown in Basra Governorate. *Basra Journal of Agricultural Sciences* 20 (1): 101-108
- Jasim A.M.; K.F. Jabor and A.H.Jasim (1991). Effect of calcium chloride and storage temperature on post harvest quality of bell pepper (*Capsicum annum* L.). *Basrah J. Agric. Sci.*, 4 (1,2).
- Kaab Omeir, M., Jafari, A., Shirmardi, M., & Roosta, H. (2019). Effects of irrigation with fish farm effluent on nutrient content of basil and purslane. *\*The National Academy of Sciences\**
- Karo', B. B., & Marpaung, A. E. (2020). Effectivity of Potassium and Fish Fertilizer on Leek Growth (*Allium fistulosum* L.). *\*Journal of Tropical Horticulture\**, 3, 23-28.
- Khan , I.,(2013). Response of Crop Geometry on the Performance of Parthenocarpic Varieties of Cucumber (*Cucumis sativus* L.) as Influenced by Humic Acid and Micro Nutrients Application under Polyhouse Condition . *Int.J.Curr.Microbiol.App.Sci*, 6(3): 1763-176
- Kumar , S ; V Chaudhar , ; S. Saravaiya and D, Raj (2017). Potentiality of greenhouse cucumber cultivars for economic and nutritional realization . *International Journal of Farm Sciences*, **7(1)**: 1-7.
- Kumari,A., Kumar,R., Bhardwaj, A., & Tripathi,v. (2021).Mean performance of gynococious cucumber hybrids in sub-tropical climate of eastern ladia . *Journal of current opinion in crop science* ,2(1) , 95-101
- Lema, A., & Degebassa, A. (2013). Comparison of chemical fertilizer, fish offal's fertilizer and manure applied to tomato and onion. *\*African Journal of Agricultural Research\**, 8, 274-278.
- Liang , W.J. : M.L. Wang and X.O. San(2008) .Effect of calcium on growth and yield of cucumber in Solor-Green House. *China Vegetables*, 1:18-19.
- Loes AK, Katsoulas N. Caceres R, de Cara M, Cirvilleri G, Kir A, Knebel L, Malinska K. Oudshoorn F, Raskin B (2018) Current use of peat, plastic and fertiliser inputs in organic horticultural andarable crops across Europe. *European Commission, Brussels, Belgium,2018*
- Mahmoud, Hazem Abdel Aziz and Marwan Ahmed Kafi Al-Rawi (2015). Effect of cultivar and planting dates on yield and components of cucumber (*Cucumis sativus* L.) plant in unheated plastic houses. *Tikrit University Journal of Agricultural Sciences* 15: (2)82-91
- Matloob, Adnan Nasser and Izz Al-Din Sultan Mohammed and Karim Saleh Abdul (1989). *Vegetable Production. Part One and Two - Revised Edition - Higher Education Press - Mosul - Iraq: 680-337 pp.*A.O.A.C. (1970). *Official methods of analysis. 11th Ed . Washington of the official analytical chemists, Washington D.C. USA .*
- Mazur, Z., & Radziemska, M. (2014). Influence of compost from fish by- products on nutrient supply in radish. *Ecological Chemistry and Engineering. A*, 21(2), 231-240,
- Mohammed, Ibrahim Anwar and Moaz Mohi Mohammed Sharif Al-Abdali and Essam Khadir Hamza Al-Hadith (2020). The effect of water stress on the growth and production of some cucumber hybrids for protected cultivation in Iraq. *College of Agriculture, University of Anbar* 18(1): 75-84
- Mustafa, H. H., Hamad, A. S., Hameed, R. T., & Mohamed, S. H. (2022). Comparing the effect of using two concentrates of liquid organic fertilizers on growth and flowering pepper plant. *\*Agricultural Statistics Science\**, 18, 1217-1224.
- Nurhidayati, M. M; and Murwani, I. (2017). Combined effect of vermicompost and earthworm *pontoscolex corethrurus* inoculation on the yield and quality of broccoli (*Brassica oleraceae* L.) using organic growing media. *Journal of Basic and Applied Research International*, 22(4), 148- 156
- Pakeerathan, K., Dayananda, A. N. P. E., & Viharnaa, R. (2023). Formulation and efficacy testing of vermi-tea based liquid organic fertilizers on green-amaranth (*Amaranthus viridis* L.) for home gardens.
- Panwar, J.S. (1982). Post harvest physiology and storage behavior of ber fruits (*Zizyphus mauritiana* Lam) in relation storage temperature and various treatments. *M. Sc. Thesis*
- Poovaiah, B.W. (1993). Biochemical and molecular aspects of calcium. *Action . Acta Hortic.*,326:139-147.
- Pragathi, K. (2014). Evaluation of cucumber (*Cucumis sativus* L.) hybrids for production potential and qualitative traits under net house conditions. *M.S.C.,Thesis, Department Pr.YSR.Horticulture university Andhar Pradesh,India.*
- Pragathi, K. (2014). Evaluation of cucumber (*Cucumis sativus* L.) hybrids for production potential and qualitative traits under net house conditions. *M.S.C.,Thesis, Department Pr.YSR.Horticulture university Andhar Pradesh,India.*
- Pragathi, K. (2014). Evaluation of cucumber (*Cucumis sativus* L.) hybrids for production potential and qualitative traits under net house conditions. *M.S.C. Thesis, Department Pr. YSR.Horticulture university Andhar Pradesh, India*



- Priyanka, B., Ramesh, T., Rathika, S., & Balasubramaniam, P. (2019). Foliar application of fish amino acid and egg amino acid to improve the physiological parameters of rice. *Int. J. Curr. Microbiol. App. Sci*, 8(2), 3005
- Radziemska, M., Vaverková, M. D., Adamcová, D., Brtnický, M., & Mazur, Z. (2019). Valorization of fish waste compost as a fertilizer for agricultural use. *Waste and Biomass Valorization*, 10, 2537-2545.
- Radziemska, M., Vaverková, M.D., Adamcová, D., Brtnický, M., and Mazur, Z. (2018): Valorization of fish waste compost as a fertilizer for agricultural use. *Waste and Biomass Valorization*, 10: 2537-2545.
- Ramesh, T., Rathika, S., Murugan, A., Soniya, R. R., Mohanta, K. K., & Prabharani, B. (2020). Foliar spray of fish amino acid as liquid organic manure on the growth and yield of \*Amaranthus\*. *\*Chemical Science Review and Letters\**, 34, 511-515.
- Rasool,A.,; M.T.Gigiou ; and H Behzad. (2009). The Effect of sheep manure vermicompost on quantitative and qualitative properties of cucumber (*Cucumis sativus* L.) grown in the greenhouse. *Afr.J. Bioethanol*. 8(19): 4953-4957.
- Sahoo, U. (2014). Protected cultivation of cucumber for assured lively hood .M.S.C-Orissa univ. of Agri.and Tech., Bhubaneswar.
- Sahoo, U. (2014). Protected cultivation of cucumber for assured lively hood .M.S.C-Orissa univ. of Agri.and Tech., Bhubaneswar.
- Sahoo, U. (2014). Protected cultivation of cucumber for assured lively hood .M.S.C-Orissa univ. of Agri.and Tech., Bhubaneswar.
- Sahoo, U. (2014). Protected cultivation of cucumber for assured lively hood .M.S.C-Orissa univ. of Agri.and Tech., Bhubaneswar.
- Sanwal SK, Laxminarayana K, Yadav DS, Rai N and Yadav RK. (2006). Growth, yield, and dietary antioxidants of broccoli as affected by fertilizer type. *Journal Veg Science* 12:13- 26
- Sarhan , T. Z. ;F.I and Salih, (2014). Effect of low temperature and seaweed extracts on flowering and yield of two Cucumber cultivars (*Cucumis sativus* L.). *International Journal of Agricultural and Food Research*, 3 ( 1): 41-54.
- Shafeek, M.R; Y.I.Helmy and N.M.Omar (2016). Effect of spraying or ground drench from humic acid on groth total output and fruits nutritional values of cucumber (*Cucumis Sativus* L.) grown under plastic house conditions. *International Journal of pham Tech Research* 9(12): 52-57
- Shahsavani, S., Abaspour, A., Parsaeeyan, M., & Yonesi, Z. (2017). Effect of fish waste, chemical fertilizer and biofertilizer on yield and yield components of bean (*Vigna sinensis*) and some soil properties. *Iranian Journal Pulses Research*, 8(1), 45-59
- Shirokov, E.P. (1988). Technology of storage and processing of fruits and vegetables. Moscow, PP 319. [ In Russian] 1
- Siddiqui, S. and F. Bangerth, (2004). Studies on cell wall mediated changes during storage of calcium ifiltrated apples, *ISHS Acta. Hort.*, 326 .
- Soc.,Hort.Sci.,97:679-682. Cresser ,M.S. and J.W. parsons (1979) . sulphric perchloric acid digestion of plant material for the determination of nitrogen,phosphorus, potassium, calcium and magnesium- *analytica chemical Acta* . 109:431-436
- Staley, L., Mortley, D. G., Bonsi, C. K., Bovell-Benjamin, A., & Gichuhi, P. (2013). Hydrolyzed Organic Fish Fertilizer and Poultry Litter Influence Total Phenolics and Antioxidants Content but Not Yield of Amaranth, Celosia, Gboma, and Long Bean. *HortScience*, 48(6), 768-772.
- Sutriana, S., Sabli, T. E., Vaulina, S., & Ulya, U. M. (2023). Optimizing the Growth and Production of Shallots (*Allium ascalonicum* L) by applying Liquid Organic Fertilizer from Kampar River Fish Waste on Ultisol Soil. *\*Jurnal Agronomi Tanaman Tropika\**, 5, 377-387.
- Taain, D.A., Jerry, A.N. and Naama, A.K., (2007) Effect of some organic acids on storability of tomtto fruit cv.super Maramond *Journal of karbala university*, vol.5(143-148
- Taain, Dhia Ahmed; M.A.Ibrahim; N.R.H.Shala (2015). Effect of spraying gibberlic acid and calcium chloride on storage ability of jujube fruits. *International Symposium of Agricultureal and Mechanical Engineering*. Bucharest. Romania
- Tain, Diao Ahmed Hamid Abdul Karim Abdul Wahid and Awatif Nima Jari (2007). Study of the storage capacity of five tomato varieties *Lycopersicon esculentum* L. grown in Basra Governorate. *Basra Journal of Agricultural Sciences*, 20 (1) 101-108.
- Thapliyal, V. (2017). Heterosis and combining ability for yield and yield attributing traits of Parthenocarpic cucumber (*Cucumis sativus* L.) under poly-net house conditions (Doctoral dissertation, Punjab agricultural university Ludhiana).
- Tomar B.S;G.S.Jat and Jogendra singh (2017) Adsances in hybrids seed production vegetables crops .university of Horticultue and forestry Nauri -173.230 Solan Himachal Pradesh .



- 
- Unggang, J. A. F., Bakar, M. N., & Khair, A. B. A. (2023). The potential of several wild invasive fish species as fish-based organic fertilizers on the growth of two common vegetables in Malaysia. *\*Sains Malaysiana\**, 52, 71-81.
- Vian, A.,D.(2016). Response of some cucumber hybrid cultivars (*Cucumis sativus* L.) grown in plastic house. *Joranal poly technic.* 6(1):1- 7
- Wu Y, Song K (2021) Anaerobic co-digestion of waste activated sludge and fish waste: Methane production performance and mechanism analysis. *J Clean Prod* 279:123678
- Yousefi,. A. (2016). Evaluating the effectiveness of different levels of humic acid the on yield of different greenhouse cucumber cultivars.*Adv.7(6):114-1*
- Yousefi,. A. (2016). Evaluating the effectiveness of different levels of humic acid on the yield of different greenhouse cucumber cultivars.*Adv.7(6):114-1*
- Yousefi,. A. (2016). Evaluating the effectiveness of different levels of humic acid on the yield of different greenhouse cucumber cultivars.*Adv.7(6):114-1*

