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ROLE OF FERTILIZATION WITH POULTRY MANUAR AND DRY YEAST ON YIELD CHARACTERISTICS FOR TWO PEPPER VARIETIES UNDER CONDITIONS MOSUL CITY

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ABSTRACT

The study was carried out in the vegetable crops research field of the Department of Horticulture and Landscape design, College of Agriculture and Forestry, University of Mosul during season spring 2023, to study Role of fertilization with poultry manuar and dry yeast on yield characteristics for two pepper varieties under conditions mosul city. The study included three factors, the first factor, which is Two types of pepper (California wonder MM75 and Sweet pepper Bloq IMP F1), and the second factor is organic fertilizer from poultry manure eat three concentrations, which are (0, 1.5, and 2) tons/donum, and the third is spraying with dry baker's yeast at three concentrations, which are (0, 5, and 10 g/ l.) liter. The results obtained were that the bloq IMP F1 variety was significantly superior to the second variety in the characteristics of number of fruits per unit, weight of fruit, and total yield per unit area. The level of organic fertilizer and poultry waste, 1.5 tons per dunum, had the best significant values in the characteristics of the number of fruits per plant and the weight of the fruit. Spraying with a concentration of 10 grams per liter of dry baking yeast also had the best significant values in the characteristics of the number of fruits per plant, the yield per plant, and the total yield, tons per unit area. The binary interaction treatment between organic fertilizer, poultry waste, 2 tons per dunum, and 10 grams per liter of yeast achieved the highest significant values in the characteristics of the number of fruits per plant. The interaction between poultry waste fertilizer of 1.5 tons per dunum and the Bloq IMP F1 variety had significant values in the characteristics of the number of fruits per plant, weight of the fruit, and total yield per unit area. The best results came from an interaction between dry baking yeast at a concentration of 10 grams per liter and the Bloq IMP F1 variety for the characteristics of fruit weight, yield per plant, and total yield per unit area compared with the rest of the binary interaction treatments.

INTRODUCTION

The pepper plant belongs to the genus Capsicum to the Solanaceae family, and its scientific name is Capsicum annuum. L. It is considered the fourth most important crop of this family after tomatoes, eggplants, and potatoes. The genus Capsicum contains about 20-30 species. All cultivated species of the Capsicum genus contain 12 pairs of chromosomes (2n=2x=24). The original homeland of pepper is Central and South America. Traces and remains of pepper fruits were found in caves in Mexico and Central America dating back to about 7000 years BC. Pepper from Vegetables have a high nutritional value and are an important source of vitamins, in addition

to their many medicinal benefits, such as anti-inflammatory, anti-allergy, and anti-cancer properties. It has been proven that the risk of cancer can be reduced by using ripe red peppers Kumari, 2013; Shaha *et al*., 2013). Organic fertilizers provide the soil with essential nutrients for plants, including nitrogen, phosphorus, potassium, and sulfur. In addition, they prepare some of the micronutrients for plants in the soil. Organic waste releases essential nutrients faster through microbial decomposition (Follett *et al*. 1981).

Therefore, farmers and workers in the field of agricultural production in various branches are required to focus on using organic fertilizers as a good source of essential elements and improving soil texture. Baking yeast (Saccharomyces cerevisia) is considered a vital plant nutrient during the vegetative growth period, the fruiting stage, flowering, and seed formation because it contains high percentages of auxins and cytokinins, which promote the accumulation of carbohydrates in the plant (Barnett *et al*. 1990). It is also considered a source of proteins and an important source of tryptophan, which is a stimulating substance for indole acetic acid, which strengthens and enhances plant growth. It also contains amino acids and mineral nutrients, which have a major role in plant growth and improvement (Fathy and Farid, 1996; Khedr and Farid, 2000, and Darweesh *et al*. 2003). Yeast contains natural growth regulators (hormones), sugars, carbohydrates, and amino acids (Abbas, 2013). Due to the lack or scarcity of applied studies on the growth and production of pepper under different levels of organic and biofertilizers Conditions of Mosul city under open agriculture. Dry baking yeast, Saccharomyces cervisiae, is also an important source of biological fertilization due to its ability to store excess phosphate in the form of chains containing (20-200) phosphate units in the gaps inside the cell.

It also stores many amino acids, especially arginine Matile (1978). It also has the ability It produces essential materials for growth, such as hormones (such as auxins, gibberellins, and cytokinins), amino acids, and sugars, in addition to being the natural source of some nutrients (Eata *et al*. 2001). Yeast is the natural source of cytokinins, auxins, and carbohydrate accumulation. It works, activates, and stimulates cell division, elongation, and protein and DNA synthesis. (Wanas, 2002). Legaspi *et al*., (2007) found, in their study of two pepper varieties (Scotch Bonnet and Caribbean Red), that they differed significantly in total yield and yield per plant, with the Caribbean Red variety superior to the Scotch Bonnet variety. Marame *et al*. (2009) in Ethiopia indicated through genetic analysis of fruit characteristics in pepper that 78 genotypes differed significantly among themselves in the number of fruits per plant, fruit length, fruit weight, and fruit yield at the 1% and 5% levels. Sharma *et al*. (2010) found in India that 23 genotypes differed significantly among themselves in fruit length and diameter, number of fruits per plant, average fruit weight, and yield per plant. McGregor and Waters (2011) in Greece, through their study of 21 lines of pepper, indicated that they differed significantly among themselves in length, diameter, and weight of the fruit, with the variety or line BI640560 and BI640532 being the best cultivated lines.

Alemu *et al*., (2016) showed that there are highly significant differences between pepper varieties for the length and diameter of the fruit, the number of fruits per plant, and fruit yield per plant when they evaluated three pepper varieties, namely marvas Pimiento, Heirloom that the Pimiento variety was significantly superior to the two varieties in the studied traits. Bianchi *et al*. (2016) found in Brazil, when evaluating 30 genotypes of pepper, that they varied significantly in both length and diameter of the fruit, and the IFES8 hybrid was superior to the dome of the hybrid. Rohini *et al.* (2017) indicated in India that there were significant differences in the traits, number of fruits per plant and length. Fruit diameter and fruit yield per plant based on 23 genotypes of pepper plants. Richardson (2017) in the Bahamas, by evaluating 3 varieties of pepper, indicated that they differed significantly in the weight of the fruits per plant, the weight of one fruit, and the yield per plant. Khan and Sridevi (2018) obtained, through their study of variations in pepper, that they varied significantly in the number of fruits per plant, the length and diameter of the fruit, and the average weight of the fruit, in addition to the plant yield per plant. When studying the genetic

analysis of pepper varieties, Esho (2019) stated that the Peperno Quadrato Giallo variety gave the highest significant values in fruit weight, while the Pepperno Quadrato D3 TI Rosso variety significantly outperformed the rest of the varieties in the number of fruits per plant and fruit diameter, while the Peperone Friariello variety outperformed the rest of the varieties. Highest values Significance in fruit length and total yield. Adeoola *et al*. (2011) obtained the highest yield for pepper when treated with fertilizer from 3.16 tons of poultry manure mixed with 60 kg of nitrogen, 40 kg of phosphorus, and 25 kg of potassium.

Ikeh *et al*. (2012) also found that the highest economic yield was given to the pepper plant when fertilized. Poultry waste tons/ha. Through the study of Jamir *et al*. (2017) in India, the number of fruits, the average diameter of the fruit, and the total yield of the experimental unit increased significantly when fertilizing the Indam Bharath hybrid pepper plant with organic fertilizer with poultry waste at three levels (50%RDM, 75%RDM, 25%RDM). Omar *et al*., (2018) obtained when fertilizing pepper plants with organic fertilizer and poultry waste (5, 10, and 15 m^3/acre) that the level of 15 m^3 per acre produced the highest significant values for yield characteristics, number of fruits per plant, average fruit weight, early fruit yield, and total yield. per unit area, in addition to the length and diameter of the fruit. Rabie and Al-Duhami (2019) indicated, through their study of the use of organic fertilizer (poultry manure) and the amino acid proline in the growth and production of pepper, that adding organic fertilizer and poultry manure at a rate of 5 and 10 tons/ha, and that the T10 intervention treatment caused significant increases in total yield... Ghoname *et al*., (2010) in Egypt indicated when spraying pepper plants (California Wonder) with baking yeast at concentrations of 1, 2, and 3 grams per liter that the concentration of 3 grams per liter gave the highest significant values in the weight of fruits per plant and the average and weight of the fruit.

Dawa *et al*. (2012) in Egypt, when spraying the Madir hybrid pepper plant with 5 grams of baking yeast caused significant increases in the weight of the fruits per plant. /acre + 75% of the NPK recommendation for pepper plants has caused significant increases in the characteristics of length, diameter and weight of the fruit. Nahed *et al*., (2015) indicated that using yeast at concentrations of 10 or 20 liters/acre of yeast (Saccharomyces cerevisiae) with a concentration of 20 liters per acre caused significant increases in early and total yield and in the length and diameter of the fruit. Abd-Alrahman and Aboud (2021) indicated in Egypt when using baking yeast at concentrations (3 grams/liter and 6 grams/liter) that the concentration of 6 grams/liter gave the moral values for the diameter, length, and weight of the fruits, in addition to the total yield, one kilogram/plant. Hanaa and Fatima (2021) also obtained in Egypt, through their study, that spraying yeast on pepper plants at 3 and 6 grams per liter achieved a significant increase in the vegetative and fruit growth indicators of the pepper variety Gedeon F1, represented in the average weight, length, and diameter of the fruit, in addition to the plant yield. the one. Mohamed *et al*. (2021) in Egypt indicated that adding baker's yeast to the soil had a significant effect on the number of fruits per plant, the fruit yield kg/m^2, the weight of the fruit, and the length and diameter of the fruit in pepper plants. As many researchers studied the parameters and correlation between yield traits and its components in pepper, The research paper aims to study the role of fertilization with poultry waste and spraying with dry bread yeast on the characteristics of the yield, its components, and the genetic parameters of two varieties of pepper under the conditions of the city of Mosul.

METHODOLOGY

The experiment was carried out in the vegetable experimental field of the Department of Horticulture and Landscape design /College of Agriculture and Forestry/University of Mosul during growing season spring 2023. The study included three factors: The first factor: It included three levels of organic fertilizer and poultry waste (0, 1.5, and 2 tons/dunum). The second factor: It included three concentrations of the baker’s yeast biofertilizer (0, 5, and 10 g/L). The third: It included two varieties of pepper (CALIFORNIA, WONDER), BLOQ IMP F1. (Sweet Pepper).

The number of treatments for each replicate was (3 x 3 x 2) = 18 experimental units. Each experimental unit consisted of two beds, 1.5 m long and 1.5 m wide (2.25 m2). Seedlings were planted on one side of the bed, at a distance of 30 cm between one plant and another (Matlob *et al.* 1989), each plant contains 5 plants (the experimental unit contains 10 plants). The experiment was organized in a completely randomized block design, a factorial experiment with a split-plot system, where the organic fertilizer and poultry waste were placed in the main plots, the yeast concentration was in the sub-plots, and the varieties were in the sub-sub plots. The bread yeast biofertilizer was sprayed three times and included: - The first spraying 20 days after the transplantation process. The second spraying 20 days after the first spraying. The third spraying was 20 days after the second spraying. As for the organic fertilizer, poultry waste, it was added once to all experimental units and for each replicate. On April 5, 2023, a week before the transplantation process. The following data and measurements were recorded: the number of fruits per plant, fruit weight(gm), length and diameter fruit (cm), the yield per plant(kg) and total yield (ton/ha.), the data were analyzed using the program (SAS, 1999) and the means were compared at the 5% probability level for the Duncan multinomial test (Al-Rawi and Khalaf Allah, 2000).

RESULTS AND DISCUSSION

It appears from Table (1) that organic fertilizer and poultry waste had a significant effect on this trait if the level of 1.5 tons of poultry waste achieved the highest number of fruits, reaching 52,611 fruits per plant. It did not differ significantly with the level of 2 tons of organic fertilizer, and it differed significantly with 0 tons of fertilizer. Poultry waste, which gave the lowest number of fruits per plant, amounted to 49,100. As a percentage of dry yeast, at a concentration of 10 grams/liter, it achieved the highest significant number of fruits per plant, amounting to 53,114, and it excelled at two levels (0, 10). As shown from the same table, the variety first (1Bloq IMPF) was significantly superior to the second class (California wonder MM75)) in this characteristic. As for the percentage of the effect of the binary interaction between the organic fertilizer, poultry waste, and dry baking yeast, the double interaction treatment achieved 2 tons of organic fertilizer, poultry waste, with 10 grams/liter. It gave the highest number of fruits, reaching 54,100, while the lowest number resulted from the binary interaction factor between 0 organic fertilizer, and the poultry waste. With 0 grams of yeast, it reached 46,650. As for the percentage of the interaction effect between 1.5 tons/acre of organic fertilizer and the first type (1Bloq IMPF), the highest number of fruits per plant was achieved, which reached 56,156 fruits per plant, and the lowest number came as a result of the interaction between 0 fertilizer. Organic poultry waste with the second type (California wonder MM75)) achieved the lowest number of fruits per plant, which amounted to 46,811, and the binary interaction factor of 10 grams/liter of bread yeast with the first type (1Bloq IMPF) achieved the highest number of fruits per plant, amounting to 56,033, and the lowest number came as a result The binary interaction between yeast and the second variety California wonder MM75) reached 47,156 fruits per plant, as shown from the same table data.

Table (1) Effect of organic fertilizer, yeast, varieties, and their interaction on the number fruits/plant for pepper plants during season of spring 2023*

Organic fertilizer (ton.donum	Dry east (g/l.)	Variety				Organic fertilizer x dry east	
		Calif wonder MM75F		Bloq IMPF1			
0	0	h	40.367	ce	52.933	c	46.650
	5	g	45.500	df	51.733	bc	48.617
	10	bd	54.567	eg	49.500	ab	52.033
1.5	0	df	50.600	bc	56.967	a	53.783
	5	df	51.333	df	50.167	abc	50.750
	10	g	45.267	a	61.333	a	53.300
	0	df	50.500	fg	47.333	bc	48.917

2	5	be	53.533	gf	47.800	abc	50.667
	10	df	50.933	b	57.267	a	54.100
Organic x variety		Calif wonder MM75F		Bloq IMPF1		Organic fertilizer	
0		d	46.811	bc	51.389	b	49.100
1.5		cd	49.067	a	56.156	a	52.611
2		b	51.656	bc	50.800	a	51.228
Dry east x variety		Calif wonder MM75F		Bloq IMPF1		Dry east	
0		d	47.156	b	52.411	b	49.783
5		bc	50.122	c	49.900	b	50.011
10		bc	50.256	a	56.033	a	53.14
Variety		49.1778 b		a	52.7815		

*The values with similar letters for each factor or their interactions individually do not differ significantly according to Duncan's polynomial test under the 5% probability level.

The triple interaction had a significant effect on the number of fruits per plant if the highest number of fruits per plant came as a result of the effect of the interaction between 1.5 tons / dunum of poultry manure with 10 grams of yeast with the first type (1Bloq IMPF). The highest number was 61,333, and the lowest number came as a result of the interaction between 0 organic fertilizer with 0 yeast and the second type (California wonder MM75)) was 40,367 fruits per plant.

Table (2) shows that the 1.5 ton/dunum treatment with organic fertilizer achieved the highest average fruit weight of 71.167 grams and did not differ significantly with 0 tons of organic fertilizer. They differed significantly with 2 tons of organic fertilizer, which gave the lowest reading of 64.944 grams per fruit, as shown from the same table shows that the concentrations of bread yeast do not have any significant effect on this trait, nor did any significant differences appear in the effect of the varieties on this trait.

Table (2) effect of organic fertilizer, yeast, varieties, and their interaction on the average fruit weight for pepper plants during season, spring 2023 *

Organic fertilizer (ton.donum	Dry yeast (g/l.)	Variety				Organic fertilizer x dry yeast	
		Calif wonder MM75F		Bloq IMPF1			
0	0	de	65.667	de	66.333	cd	66.000
	5	b	74.667	de	64.667	bc	69.667
	10	bd	69.000	bc	73.667	b	71.333
1.5	0	a	82.333	bd	68.667	a	75.500
	5	de	64.333	bc	73.667	bd	69.000
	10	be	68.000	dd	70.000	bd	69.000
2	0	de	65.667	de	63.667	d	64.667
	5	e	62.000	de	67.667	d	64.833
	10	e	62.000	be	68.667	cd	65.333
Organic x variety		Calif wonder MM75F		Bloq IMPF1		Organic fertilizer	
0		ab	69.778	ab	68.222	a	69.0000
1.5		a	71.556	a	70.778	a	71.1667
2		c	63.222	b	66.667	b	64.9444
Dry yeast x variety		Calif wonder MM75F		Bloq IMPF1		Dry yeast	
0		a	71.222	b	66.222	a	68.722
5		b	67.000	ab	68.667	a	67.833
10		b	66.333	a	70.778	a	68.556
Variety		a	68.1852	a	68.5556		

*The values with similar letters for each factor or their interactions individually do not differ significantly according to Duncan's polynomial test under the 5% probability level.

As for the effect of the dual interaction, the level of 1.5 tons/dunum of organic fertilizer with 0 grams/liter of yeast achieved the highest average weight of fruit, reaching 75,500 grams, and it differed significantly with the rest of the interaction treatments. The lowest fruit weight came as a result of the dual interaction between 2 tons/dunum of organic fertilizer. With 0 yeast, which amounted to 64.667 grams, also shown in the same table, the double interaction treatment of 1.5 tons/dunum of organic fertilizer and poultry waste with the second variety (California wonder MM75) gave the highest weight of the fruit, amounting to 71.556 grams, and the lowest weight of the fruit came through the effect of the interaction of 2 tons of organic fertilizer with the second variety, California wonder MM75.)) reached 63.222, and the binary interaction treatment of 0 yeast with the second variety (California wonder MM75) achieved the highest fruit weight of 71.222 grams, and it differed significantly with some of the binary intervention treatments, and the lowest fruit weight came as a result of the binary interaction between 0 grams of yeast with the first variety (1Bloq IMPF) 66.222 grams. It also appears from Table (2) that the highest weight of the fruit came as a result of the triple interaction between 1.5 tons/acre of organic fertilizer, 0 yeast, and the second type (California Wonder MM75)) amounted to 82.333 grams, and the lowest weight of the fruit came as a result of the interaction of 2 tons of organic fertilizer. With (5 and 10) grams of yeast and the second type (California wonder MM75), which amounted to (62,000) grams.

From table (3) it appears that (0 and 1.5 tons) of organic fertilizer and poultry waste achieved the highest fruit length and did not differ significantly between them, but they differed significantly with the treatment of 2 tons/acre of organic fertilizer and poultry waste, which produced the lowest fruit length of 6.375 cm. It appears from the table that the levels of yeast or varieties do not reach the level of significance with their single effect on this characteristic. While the binary interaction treatment between 0 tons of organic fertilizer and 10 grams/liter of yeast achieved the highest fruit length of 7.017 cm, and it differed significantly with the binary interaction of 2 tons of organic fertilizer and the three levels of yeast. As for the binary effect between organic fertilizer and poultry waste 1.5 tons/ With the first variety (1Bloq IMPF), the highest length of the fruit reached 7.306 cm, and it differed significantly with some of the bilateral interaction coefficients. The lowest length came as a result of the bilateral interaction between 1.5 tons/acre with the second variety (California wonder MM75) and it reached 6.611 cm. As shown from the same table, it did not There was no significant effect of the binary interaction of yeast concentrations and varieties on this trait. As for the effect of the triple interaction between the three factors, it may appear from the table data that there are significant differences in this trait. The triple interaction treatment between 1.5 tons/dunum of organic fertilizer and 0 grams/liter of yeast with the first type (1Bloq IMPF) achieved the highest significant length for this trait. It reached 7.48 cm, and the smallest length came as a result of the triple mixture of 2 tons of organic fertilizer with yeast and the first type (1Bloq IMPF), which reached 6.167 cm. From Table (4) it appears that there was no significant effect of the three factors studied (organic fertilizer, bread yeast, and varieties) individually on this characteristic. As for the binary interaction of organic fertilizer, poultry waste and yeast, it did not reach the level of significance.

Table (3) The effect of organic fertilizer, yeast, varieties, and their interaction on the average length of fruit (cm) of pepper plants during season, spring 2023 *

Organic fertilizer (ton.donum	Dry yeast (g/l.)	Variety				Organic fertilizer x dry yeast	
		Calif wonder MM75F		Bloq IMPF1			
0	0	ac	7.1167	ac	6.8667	a	6.9917
	5	ac	7.1333	ac	6.7833	a	7.9583
	10	ab	7.2000	ac	6.8333	a	7.0167

1.5	0	bc	6.4667	a 7.4833	a 6.9750
	5	ac	6.7000	ab 7.2667	a 6.9833
	10	ac	.6.6667	ac 7.1667	ab 6.9167
2	0	c	6.2833	c 6.1667	c 6.2250
	5	bc	6.3000	ac 6.6000	bc 6.4500
	10	bc	6.3167	ac2.5833	bc 6.4500
Organic x variety		Calif wonder MM75F		Bloq IMPF1	Organic fertilizer
0		a7.1500		6.8278	a 6.98889
1.5		b	6.6111	7.3056	a 6.95833
2		b	6.3000	6.4500	a 6.37500
Dry yeast x variety		Calif wonder MM75F		Bloq IMPF1	Dry yeast
0		a	6.6222	a6.8278	a 6.7306
5		a	6.7111	a. 7.3056	a 6.7972
10		a	6.7278	6.5600 a	a 6.7944
Variety		a	6.6870	6.8611 a	

*The values with similar letters for each factor or their interactions individually do not differ significantly according to Duncan's polynomial test under the 5% probability level.

The percentage of the effect of the binary interaction between organic fertilizer 1.5 tons/dunum of poultry waste and the first type (Bloq IMP1) achieved the highest fruit diameter of 5.456 cm and differed significantly only with the binary interaction treatment of 2 tons. /Acre with organic fertilizer with the second variety (California wonder MM75), which amounted to 4,900 cm. Regarding the effect of the triple intervention, the intervention treatment of 1.5 tons/dunum of organic fertilizer with 10 grams of yeast and the first variety (1Bloq IMP) achieved the highest fruit diameter of 5.8006 cm. It differed significantly with the triple intervention treatment between 2 tons/dunum of organic fertilizer with (0 and 10) grams. Yeast with second class (California wonder MM75).

Table (4) effect of organic fertilizer, yeast, varieties, and their interaction on the average diameter of the fruit (cm) for pepper plants during season, spring 2023*

Organic fertilizer (ton.donum)	Dry yeast (g/l.)	Variety		Organic fertilizer x dry yeast
		Calif wonder MM75F	Bloq IMPF1	
0	0	ab 5.1667	ab 5.10000	a 5.1667
	5	ab 5.5500	ab 5.1667	a 5.5500
	10	ab 5.5667	ab 5.1000	a 5.5667
1.5	0	ab 5.5167	ab 5.2500	a 5.5167
	5	ab 5.1833	ab 5.3167	a 5.1833
	10	ab 5.1333	a 5.8000	a 5.1333
2	0	b 4.7667	ab 5.2833	a 4.7667
	5	ab 5.1000	ab 5.0000	a 5.1000
	10	d 4.8333	ab 4.9733	a 4.8333
Organic x variety		Calif wonder MM75F	Bloq IMPF1	Organic fertilizer
0		a 5.4278	ab 5.1222	a 5.2750
1.5		ab 5.2778	a 5.4556	a 5.3667
2		b 4.9000	ab 5.0856	a 4.9928
Dry yeast x variety		Calif wonder MM75F	Bloq IMPF1	Dry yeast
0		a 5.1500	a 5.2111	a 5.1806

5	a	5.2778	a	5.1611	a	5.2194
10	a	5.1778	a	5.2911	a	5.2344
Variety	a	5.2019	a	5.2211		

*The values with similar letters for each factor or their interactions individually do not differ significantly according to Duncan's polynomial test under the 5% probability level.

Table (5) indicate that the organic fertilizer at 2 tons/dunum achieved the highest total plant yield, amounting to 17,752 kg. This level was significantly superior to the levels (0.1.5) tons/dunum. Also, the spraying treatment with 10 grams/liter of yeast achieved the highest yield. The plant yield reached 18,100 kilograms and was significantly superior to two concentrations (0, 10) grams/liter. The first variety (1Bloq IMPF) outperformed the second variety (California wonder MM75) in terms of yield per plant.

Table (5) The effect of organic fertilizer, yeast, varieties, and their interaction on the yield per plant (kg) of pepper during season, spring 2023*

Organic fertilizer (ton.donum	Dry east (g/l.)	Variety				Organic fertilizer x dry yeast	
		Calif wonder MM75F		Bloq IMPF1			
0	0	i	12.372	ef	15.898	e	14.134
	5	df	16.032	gh	14.230	b	15.131
	10	ce	16.990	ab	18.934	b	17.962
1.5	0	fg	15.393	a	19.742	b	17.567
	5	h	13.728	cd	17.229	d	15.478
	10	ef	15.742	ab	19.103	bc	17.422
2	0	cd	18.212	cd	17.304	b	17.758
	5	df	16.202	ce	16.964	c	16.583
	10	a	19.609	bc	18.223	a	18.916
Organic x variety		Calif wonder MM75F		Bloq IMPF1		Organic fertilizer	
0		d	15.131	c	16.353	c	15.742
1.5		d	14.954	a	18.691	b	16.823
2		b	18.008	b	17.497	a	17.752
Dry yeast x variety		Calif wonder MM75F		Bloq IMPF1		Dry yeast	
0		d	15.325	b	17.648	b	16.487
5		d	15.321	c	16.141	c	15.731
10		b	17.447	a	18.753	a	18.100
Variety		b	16.031	a	17.514		

*The values with similar letters for each factor or their interactions individually do not differ significantly according to Duncan's polynomial test under the 5% probability level.

As for the binary interaction between the factor 2 tons/dunum of organic fertilizer with 10 grams/liter of baking yeast, it achieved the highest yield per plant, amounting to 18.916 kilograms, and it was significantly superior to the rest of the binary interaction treatments. The lowest yield came as a result of the interaction between (0, 0) of organic fertilizer and Yeast reached 14.134, while through double-interaction treatments between organic fertilizer at the level of 1.5 tons/dunum and the first type (1Bloq IMPF), it achieved the highest yield per plant, amounting to 18.691 kg, and surpassed all other double-interaction treatments. It also significantly outperformed the double-interaction treatment. Among 10 grams/liter of yeast with the first type (1Bloq IMPF),

the highest early yield reached 18.753 kilograms and it significantly outperformed the rest of the binary interference treatments. We also find from the data in Table (5) that the triple interference factor of organic fertilizer 1.5 tons/dunum with 0 grams/liter of yeast with the first class (1Bloq IMPF) amounted to 19.742 kg, which was significantly superior to most of the triple interference treatments, and the lowest yield per plant came from the triple interference. 0 tons/dunum of organic fertilizer with 0 grams/liter of second-class yeast (California wonder MM75) amounted to 12.372 kg. According to Table (6), a fertilization treatment at a rate of 2 tons/dunum of organic fertilizer achieved the highest total yield per unit area, amounting to 40.664 tons/ha. This treatment was significantly superior to two treatments (0, 1.5) tons/dunam. The spraying treatment also outperformed pepper plants by 10 Grams/liter significantly in terms of total yield amounted to 42.875 tons/ha at two concentrations (0.5) grams/liters. As for the percentage of varieties, the first variety (Bloq IMPF1) was significantly superior to the second variety (California wonder MM75) in terms of total yields, which amounted to 41.0410 tons/ha. Regarding the dual interaction treatments between organic fertilizer and yeast, the interaction treatment between 2 tons/dunum of organic fertilizer and 10 grams/liter of yeast outperformed all the other treatments, which achieved a unit area total of 45.355 tons/ha. The dual interaction treatment of 1.5 tons/dunum also had an effect. Organic fertilizer with the first type (Bloq IMPF1)) The highest yield per unit area reached 43.044 tons / hectare. This treatment was significantly superior to some of the binary interaction treatments, except for the binary interaction treatment between 2 tons / dunum of organic fertilizer and the same type, while the binary interaction treatment achieved 10 g/liter of yeast, and the first type (Bloq IMPF1) had the highest total yield, reaching 45.321 tons/ha, and it significantly outperformed all binary interference treatments. We note from the table that the three-way interaction between the studied factors significantly affected this trait at the 5% probability level for Duncan's multinomial test if the three-way interaction treatment between 0 tons/acre of organic fertilizer and 10 grams/liter of yeast with the first class (Bloq IMPF1) achieved the highest The total yield per unit area reached 45,600 tons/ha, and the lowest total yield came as a result of the triple interaction between 1.5 tons/acre of organic fertilizer with 5 grams/liter of yeast and the second variety (California wonder MM75) and amounted to 29,227 tons/ha.

The results of tables (1, 2, 5, and 6) show that the organic fertilizer and poultry waste significantly affected the yield indicators and its components represented by the number of total fruits per plant, the average weight and yield of one plant, kg, and the total yield, tons per hectare. This result may be explained because the organic fertilizer and poultry waste contain nutrients and organic matter, which are very important in plant nutrition and which also affect the characteristics of the crop and its components (Lotter, 2003). These results were consistent with what has been indicated by many studies and applied research that organic fertilizers have a major role in fruit growth indicators and yield quality in pepper plants (Huez-Lopez *et al*., 2011). This is what was stated by both (Legespi *et al.* 2007; Berova *et al*. 2010; Adeoola *et al*. 2011, Taleb *et al*. 2012; Shahein *et al*. 2015, El -Shimi *et al*. 2017) who obtained through their research that organic fertilizer and poultry waste had a positive, significant effect on increases in the characteristics of number of fruits, average fruit weight, and total pepper yield.

Table (6) The effect of organic fertilizer, yeast, varieties, and the interaction between them on the total yield, tons/ha of pepper during season, spring 2023*

Organic fertilizer (ton.donum)	Dry yeast (g/l.)	Variety		Organic fertilizer x dry yeast
		Calif wonder MM75F	Bloq IMPF1	
0	0	f 29.977	cd 38.443	d 34.210
	5	bc 39.137	df 33.723	d 36.430
	10	ab 44.030	a 45.600	a44.815
1.5	0	ce 35.750	a 44.837	b40.293
	5	f 29.227	bc 39.420	d34.323

	10	ef	32.033	a	44.877	bc	38.455
2	0	ce	36.690	bc	39.287	bc	37.988
	5	ce	36.287	ac	44.030	bc	38.650
	10	a	45.223	a	45.487	bc	45.355
Organic x variety		Calif wonder MM75F		Bloq IMPF1		Organic fertilizer	
0		c	37.714	bc	39.256	b	38.485
1.5		d	32.337	a	43.044	b	37.691
2		bc	39.400	ab	41.929	a	40.664
Dry yeast x variety		Calif wonder MM75F		Bloq IMPF1		Dry yeast	
0		c	34.139	b	40.856	b	37.497
5		c	34.883	b	38.052	b	36.467
10		b	40.429	a	45.321	a	42.975
Variety		b	36.483	a	41.409		

*The values with similar letters for each factor or their interactions individually do not differ significantly according to Duncan's polynomial test under the 5% probability level.

And with Zeyad and Salman (2021) for fruit and yield indicators in pepper plants. It also appears from the data in Tables (1, 5, and 6) that dry baking yeast had a significant effect on the yield indicators and its components, represented by the characteristics of the number of total fruits per plant, the yield per plant, and the total yield, tons per hectare. These results may be explained as a result of the role of dry baking yeast in its effect on improving and enhancing these characteristics due to the macro- and micro-nutrients it contains. Dry baking yeast is an important source of biological fertilization due to its ability to store excess phosphate in the form of chains containing 20-200 phosphate units in the vacuoles inside the cell to store many amino acids (Matile, 1978). It has the ability to produce essential substances for plant growth, including hormones, and it is the natural source of cytokinins that stimulate plant growth (Amer, 2004). Yeast extract also has a major role during the stages of vegetative growth and plant development, as a result of it containing the growth regulators auxins and carbohydrate accumulation (Barnett et al., 1990). Yeast works to activate and stimulate plant cell division and elongation and protein and DNA synthesis (El-Desouky *et al*., 1998, and Wanas, 2002).

These results obtained regarding the effect of spraying yeast on pepper plants are in agreement with many researchers (Fathy and Farid, 1996; El-Tohamy *et al*., 2008; Ghoname *et al*., 2010; Dawa *et al*., 2012; and El-Shimi *et al*., 2015 ; Nahed *et al*., 2015; Abd-Alraman and Aboud 2021; Hanaa and Fatima, 2021 and Mohamed *et al*., 2021) have indicated through their research that spraying baker's yeast on pepper plants It had a significant positive effect on increases in fruit growth indicators, represented by the characteristics of the number of total fruits per plant, the yield per plant, and the total yield, tons per hectare. It is noted from the results obtained through Tables (1 and 5) that the pepper varieties differed significantly among themselves in some characteristics of the yield indicators represented by the number of fruits per plant and the yield per plant. This result may be explained by the differences in genetic and genetic factors found in each variety, in addition to the difference in the response of the two varieties to the environment of the plant bud and the prevailing environmental conditions in the study site. Varieties vary in gene expression, which plays a major role in showing the effect on a particular trait. These results obtained through this study were consistent with many studies and applied research by many researchers (Marama *et al*.,2009; Sharma *et al*. 2010; Mc-Gregor and Waters 2011; Al-Shammari 2015 and Rohini *et al*. 2017; Soares *et al*., 2018; Esho 2019; and Zeyad and Salman 2021) who indicated that varieties and genetic compositions of pepper differ significantly from each other in length, diameter, and weight of the fruit, and in the number of fruits. For each plant, and the yield per plant. As for the effect of the double and triple interaction between organic fertilizer, poultry waste, dry yeast spray, and pepper varieties, it had a significant effect on the characteristics of the

fruits, yield, and its components. This may be explained by the combined and cumulative effect of these three factors on the outcome indicators and its components.

CONCLUSION

Through the results obtained from this study, we conclude that the Sweet pepper Bog IMPFI variety was better in traits fruit number , yield per plant and total yield , while poultry manure and dry yeast were benefic to improve the yield and its components in pepper plant .

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