Response of soaking corn seeds (*Zea mays* L.) in salicylic acid and foliar spray with yeast extract on growth and yield

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Abstract

A field experiment was conducted at the Agricultural Research Station of the Department of Field Crops, College of Agriculture, University of Diyala, during the autumn season of 2025. The study aimed to evaluate the response of c0rn grain yield and its components to seed soaking in salicylic acid and foliar spraying with yeast extract. The experiment was arranged in a **Randomized Complete Block Design (RCBD)** following a factorial experiment arrangement with three replications.

The experiment included two factors. The first factor was seed soaking in salicylic acid at two concentrations (35 and 70 mg L^{-1}), in addition to the control treatment (soaking in distilled water only). The second factor was foliar spraying with yeast extract at three concentrations (7, 14, and 21 g L^{-1}), along with the control treatment (spraying with water only).

The results showed that seed soaking in salicylic acid at **70 mg L^{-1}** significantly outperformed the other treatments in grain yield and its components. It recorded the highest mean values for ear length (23.364 cm), number of rows per ear (18.107 rows ear^{-1}), number of grains per row (41.807 grains row^{-1}), grain yield (6.183 t ha^{-1}), and shelling percentage (85.241%).

The results also indicated that foliar spraying with yeast extract at **21 g L^{-1}** achieved the highest mean values and differed significantly from the other treatments in ear length, number of rows per ear, number of grains per row, 500-grain weight, grain yield, and shelling percentage, recording averages of 25.413 cm, 19.853 rows ear^{-1}, 46.097 grains row^{-1}, 173.88 g, 6.392 t ha^{-1}, and 83.993%, respectively.

The interaction between the two study factors had a significant effect on all traits studied.

Keywords: Seed soaking, salicylic acid, yeast extract, corn, grain yield

Introduction

Corn (*Zea mays* L.), also known as the "Queen of Cereals," belongs to the family **Poaceae**. It ranks third in importance after wheat and rice, with global and local production reaching approximately 1,241 million tons and 538 thousand tons, respectively. Due to its grains being rich in carbohydrates, proteins, oils, minerals, and vitamins B_1, B_3, B_9, and C, corn contributes about 17% of human food consumption. Meanwhile, approximately 83% of global corn production is utilized as animal feed or for industrial purposes, making it a major driver of the global

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agricultural economy (Yadav, 2021; Agricultural Statistics Directorate, 2023; FAO, 2023).

Salinity constitutes a major challenge to global food security, particularly in arid and semi-arid regions, because of its direct impact on plant growth and physiological processes, which ultimately results in reduced crop productivity (Mahawar et al., 2024). Therefore, there is a growing need to develop simple, effective, low-cost, and environmentally safe approaches to mitigate the adverse effects of salinity stress (Khan et al., 2015). Seed priming before sowing has emerged as a practical and safe strategy for alleviating the negative impacts of various environmental stresses. It enhances plant growth under saline conditions without requiring genetic engineering interventions (Ellouzi et al., 2023; Sahoo et al., 2025).

Among seed-priming agents, salicylic acid has proven to be a cost-effective and biologically efficient approach for improving plant growth and productivity under diverse environmental conditions. As a plant growth regulator, salicylic acid mitigates the harmful effects of environmental stresses by enhancing antioxidant enzyme activity, regulating hormonal balance, improving photosynthetic efficiency, and increasing nutrient uptake, which positively affects crop yield and its components (Karimi et al., 2025; Youssef et al., 2025). Several studies have demonstrated the positive role of salicylic acid seed soaking in improving corn yield and its components. For example, Li et al. (2017) reported a significant increase in grain yield and yield components when corn seeds were soaked in 0.5 mM salicylic acid. The number of grains per ear increased to 418 grains ear^{-1}, and grain yield reached 7.6 t ha^{-1}, compared with 356 grains ear^{-1} and 6.1 t ha^{-1} in the water-soaked control treatment. Similarly, Szalai et al. (2016) reported that soaking corn seeds in 0.5 mM salicylic acid for 24 hours significantly increased both the number of grains per ear and grain yield.

The use of yeast (*Saccharomyces cerevisiae*) has become an environmentally friendly and sustainable alternative that helps reduce dependence on chemical inputs, thereby minimizing environmental pollution and improving agricultural production quality. Yeast contains essential minerals, amino acids, vitamins, and growth regulators that stimulate physiological processes, enhance photosynthetic efficiency, improve hormonal balance, and increase nutrient uptake efficiency. In addition, it strengthens plant tolerance to various environmental stresses, resulting in improved yield and yield components (Parapouli et al., 2020; Mohamed&Hesham, 2011).

Numerous studies have confirmed the beneficial effects of yeast extract on corn grain yield and its components. In Iraq, Al-Dulaimi et al. (2021) found that foliar application of yeast extract at 1 g L^{-1} significantly outperformed other biofertilizers in yield traits, producing the highest 100-grain weight (64.06 g) and grain yield (11.342 t ha^{-1}). Likewise, in Syria, Khader (2024) demonstrated that foliar spraying with yeast extract at concentrations of 0, 5, 10, 15, and 20 g L^{-1} significantly affected grain yield and its components. The 15 g L^{-1} treatment produced the highest averages for ear length, number of rows per ear, grains per row, grains per ear, 1000-grain weight, shelling percentage, and grain yield compared with the control treatment, which recorded the lowest values for these traits. This study was conducted to investigate the response of corn (*Zea mays L.*) grain yield to seed soaking in salicylic acid and foliar application of yeast extract, and to determine the optimum

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concentration of both treatments for achieving the highest grain yield.

Materials and Methods

A field experiment was conducted at the Agricultural Research Station of the Department of Field Crops Sciences, College of Agriculture, University of Diyala, during the autumn growing season of 2025. The station is located at longitude **44.63° E** and latitude **33.74° N**. The experiment aimed to investigate the response of corn grain yield and its components to seed soaking in salicylic acid and foliar application of yeast extract.

The experiment was carried out on a soil whose physical and chemical properties are presented in **Table (1)**.

Table (1). Physical and Chemical Properties of the Experimental Soil Before Planting

Unit	Value	**Properties**
dSm^{-1}	8.3	EC
	7.7	PH
mg kg^{-1}	21.7	N
mg kg^{-1}	4.9	P
mg kg^{-1}	346	K
%	1.3	O.M
		Soil separates
%	30.24	CIay
	38.56	SiIt
	31.20	Sand
	Clay loam	**Soil texture**

Experimental Design and Field Procedures

The experiment was arranged according to a **Randomized Complete Block Design (RCBD)** in a factorial arrangement. Two factors were included in the study. The first factor consisted of seed soaking in salicylic acid at three concentrations: distilled water only (control), 35 mg L^{-1}, and 70 mg L^{-1}, designated as **S_0 , S_1 , and S_2** , respectively. The second factor was foliar application of yeast extract at four concentrations: 0, 7, 14, and 21 g L^{-1}, designated as **Y_0 , Y_1 , Y_2 , and Y_3** , respectively.

Following land preparation, which included ploughing, harrowing, and levelling, the field was divided into three replicates. Each replicate contained 12 experimental units, with each unit measuring **3 m × 2 m (6 m^2)**, resulting in a total of **36 experimental units**.

Before planting, the field was fertilized with **DAP fertilizer** (18% N and 46% P_2O_5) at a rate of **475 kg ha^{-1}** (Hamdan, 2011). Sowing was carried out on **15 July 2025** using seeds of the

Drachma variety, imported by the Turkish company Syngenta. Before sowing, seeds were soaked for **12 hours** in the designated salicylic acid (Surechem Products Ltd., UK) concentrations described above.

Seeds were planted in hills spaced **25 cm** apart within rows, while the distance between rows was **70 cm**. Three seeds were placed in each hill at a depth of **5 cm** (Nemergut et al., 2021). Thinning was performed 21 days after planting, when plants had reached the **2–3 leaf stage** (Hallauer, 1969).

To prevent infestation by the corn stem borer, Sesamia cretica, plants were treated with **10% granular diazinon** at a rate of **6 kg ha^{-1}**, and the application was repeated 15 days after the first treatment (Al-Ali, 1980).

Thirty days after sowing, plants were sprayed using a knapsack sprayer with the designated concentrations of yeast extract (the specifications of which are presented in **Table 2**). A second spraying was conducted **45 days after planting**. Both applications were carried out in the afternoon to avoid possible adverse effects of high temperatures on yeast activity. In both sprayings, **Tween-20** was used as a surfactant to reduce droplet aggregation on the leaf surface.

Preparation of Yeast Extract

The yeast extract used in this study was prepared as follows: the specified quantities of yeast were placed in plastic containers, and an equal amount of sugar was added as a nutrient source for yeast activation. One liter of distilled water at **25°C** was then added to each container, and the mixture was shaken until complete dissolution was achieved. The containers were subsequently kept in a dark place for **24 hours** to allow fermentation, while the caps were loosened to facilitate the release of gases produced during the fermentation process (Al-Obaidy et al., 2022).

Table (2). Chemical Composition of Yeast Extract *(Abou El-Yazied, Mady,2012, and Taha et al., 2021)*

Growth Regulators ppm		Vitamins (mg·100 g^{-1} dry weight)		Amino Acids %	
31	**Adenine**	**23.33**	**Vit.B_1**	**1.69**	Alanine
56	**Betaines**	**21.04**	**Vit.B_2**	**1.49**	Arginine
0.6	**IAA**	**20.67**	**Vit.B_6**	**2.32**	Aspartic acid
0.3	**Gibberellins**	**19.17**	**Vit.$B1_2$**	**0.63**	Cysteine
Mineral Elements %		**23.21**	**Thimain**	**3.76**	Glutamic acid
6.88	**Nitrogen**	**27.19**	**Riboflavin**	**1.45**	Glycine
0.66	**Phosphorus**	**20.43**	**Insitol**	**0.71**	Histidine
0.95	**Potassium**	**20.04**	**Biotin**	**0.85**	Isoleucine
0.19	**Magnesium**	**73.92**	**Nicotinic acid**	**1.91**	Leucine

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0.17	**Calcium**	**38.43**	**Panthothenic acid**	**1.13**	Lysine
0.48	**Sulfur**	**29.49**	**P-aminobenzoic acid**	**0.4**	Methionine
107 ppm	**Iron**	**26.22**	**Folic acid**	**1.18**	Phenylalanine
77 ppm	**Zinc**	**22.09**	**Pyridoxine**	**1.29**	Proline
5 ppm	**Copper**			**1.98**	Serine
13 ppm	**Manganese**	**%43**	**Crude Protein (CP)**	**1.54**	Threonine
		%2.2	**Fats**	**0.25**	Tryptophan
		%33.2	**Carbohydrates**	**0.99**	Tyrosine
		%7.20	**Crude Fiber (CF)**	**1.4**	Valine

The necessary crop management practices were carried out as required throughout the growing season. Upon reaching full maturity, measurements related to grain yield and its components were taken from the two central rows of each experimental unit. The following traits were studied:

1. **Ear length (cm):** Ear length was measured from the base to the tip of the ear using a ruler graduated in centimeters. Measurements were taken from ears collected from the two central rows of each experimental unit, and the average was calculated.
2. **Number of rows per ear (rows ear^{-1}):** This trait was calculated as the average number of rows of the ears collected from the two central rows of each experimental unit.
3. **Number of grains per row (grains row^{-1}):** The average value of this trait was determined by counting the number of grains in a single row of the ears collected from the two central rows of each experimental unit.
4. **500-grain weight (g) at 15.5% moisture content:** After shelling the ears, 500 grains were counted from each experimental unit. Following adjustment of grain moisture content to 15.5%, the grains were weighed using a sensitive balance.
5. **Grain yield (t ha^{-1}):** This trait was calculated after shelling the ears harvested from the two central rows. Grain weight was adjusted for grain moisture content to 15.5%,
6. **Shelling percentage (%):** This trait was calculated using the following equation (Tandzi and Mutengwa, 2020):

Shelling percentage (%) = (Grain weight / Ear weight) × 100.

Statistical Analysis

After data collection and tabulation, the data were statistically analyzed according to the **Randomized Complete Block Design (RCBD)** arranged as a factorial experiment using **SAS software version 9.4 (2022)**. Significant differences among treatment means were compared using **Duncan's Multiple Range Test (DMRT)**

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at the **0.05 level of significance** (Steel and Torrie, 1980).

Results and Discussion

Ear Length (cm)

The data in Table (3) show that treatment S_2 recorded the highest mean ear length (**23.364 cm**), whereas treatment S_0 produced the lowest mean (**22.025 cm**). This increase may be attributed to the phytohormonal role of salicylic acid in stimulating cell division and elongation in the meristematic tissues of the ear. In addition, salicylic acid inhibits the activity of **auxin oxidase** enzymes, thereby preserving auxin levels, which are primarily responsible for cell elongation within the floral axis.

The results further reveal that treatment Y_3 produced the highest mean ear length (**25.413 cm**), representing an increase of **30.10%** compared with treatment Y_0, which recorded the lowest mean (**19.533 cm**). This effect may be attributed to the presence of growth-promoting hormones in yeast extract, particularly gibberellins and auxins, which stimulate ear growth and enhance cell elongation, resulting in increased ear length.

Table (3) also demonstrates a significant interaction between the two study factors. This interaction can be attributed to differences in the relative response of salicylic acid soaking treatments to foliar application of yeast extract. Under treatment S_0, ear length decreased at Y_2 before increasing again at Y_3. In contrast, treatments S_1 and S_2 exhibited a similar response pattern, characterized by a linear increase in ear length as the concentration of yeast extract increased.

Table (3). Effect of Seed Soaking in Salicylic Acid, Foliar Application of Yeast Extract, and Their Interaction on Mean Ear Length (cm)

Mean	Yeast Extract Concentrations (g.L-1)				Salicylic Acid (mg.L-1)
	Y_3	Y_2	Y_1	Y_0	
22.025 ^{b}	24.247 ^{abcd}	21.830 ^{cde}	23.057 ^{bcd}	18.967^{f}	S_0
23.065 ^{ab}	25.687 ^{a}	24.373 ^{abc}	22.793 ^{bcd}	19.407^{ef}	S_1
23.364 ^{a}	26.307 ^{a}	25.157 ^{ab}	21.767 ^{de}	20.227 ^{ef}	S_2
	25.413 ^{a}	23.787 ^{b}	22.539 ^{b}	19.533 ^{c}	**Mean**

• Different letters (a, b, c, d, e, and f) indicate the significant differences among the means of each treatment.

Number of Rows per Ear (rows ear^{-1})

The data in Table (4) indicated that treatment S_2 achieved the highest mean number of rows per ear (**18.107 rows ear^{-1}**), representing an increase of **6.70%** over treatment S_0, which recorded the lowest mean (**16.968 rows ear^{-1}**). This may be attributed to the role of salicylic acid in providing favorable conditions for plant growth under salinity stress conditions (Table 2), as it enhanced germination efficiency and activated early defense mechanisms, thereby reducing

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stress severity and ion toxicity on the meristematic tissues of the female inflorescence during its developmental stages. Consequently, the efficient translocation of photosynthetic assimilates to the developing ear was maintained, leading to an increase in the number of rows per ear compared with the other treatments.

The results in Table (4) also showed that treatment **Y_3** produced the highest mean number of rows per ear (**19.853 rows ear^{-1}**), with an increase of **30.59%** compared with treatment **Y_0** , which recorded the lowest mean (**15.203 rows ear^{-1}**). This effect may be attributed to the rich composition of yeast extract, which contains auxins, cytokinins, high concentrations of B vitamins (particularly niacin, riboflavin, and thiamine), amino acids, and both macro- and micronutrients, especially phosphorus and zinc. These components play important roles in cell division and the synthesis of nucleic acids (DNA and RNA), thereby enhancing the ear's capacity for lateral growth and increasing the number of rows per ear.

Table (4) further demonstrated a significant interaction between the two study factors. This interaction may be attributed to differences in the relative response of salicylic acid soaking treatments to foliar application of yeast extract. Under treatments **S_0** and **S_2** , the mean number of rows per ear decreased at **Y_2** before increasing again at **Y_3** . In contrast, treatment **S_1** exhibited a linear increase in the number of rows per ear with increasing yeast extract concentrations.

Table (4). Effect of Seed Soaking in Salicylic Acid, Foliar Application of Yeast Extract, and Their Interaction on the Mean Number of Rows per Ear (rows ear^{-1})

Mean	**Yeast Extract Concentrations (g.L-1)**				**Salicylic Acid (mg.L-1)**
	Y_3	**Y_2**	**Y_1**	**Y_0**	
16.968^{b}	19.627 ^{ab}	16.500^{def}	17.373 ^{cde}	`14.370 ^{g}	**S_0**
17.269 ^{b}	20.373^{a}	17.833 ^{bcde}	16.000 ^{efg}	14.870^{fg}	**S_1**
18.107 ^{a}	19.560^{ab}	17.997 ^{bcd}	18.500 ^{bc}	16.370 ^{def}	**S_2**
	19.853 ^{a}	17.443^{b}	17.291 ^{b}	15.203 ^{c}	**Mean**

• Different letters (a, b, c, d,e, f ,g) indicate the significant differences among the means of each treatment.

Number of Grains per Row (grains row^{-1})

The data in Table (5) showed that treatment **S_2** achieved the highest mean number of grains per row (**41.807 grains row^{-1}**) compared with treatment **S_1** , which recorded the lowest mean (**38.486 grains row^{-1}**). This may be attributed to the fact that treatment **S_2** produced the greatest ear length compared with the other treatments (Table 4), thereby providing a larger space for grain development within each row.

The results further indicated that foliar application of yeast extract significantly increased the number of grains per row. Treatment **Y_3** recorded the highest mean (**46.097 grains row^{-1}**), representing an increase of **39.14%** compared with treatment **Y_0** , which produced the lowest

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mean (**33.131 grains row^{-1}**). This effect may be attributed to the role of yeast extract in increasing ear length (Table 4) and promoting ear growth, thereby providing a greater area for grain formation within a single row.

The results in Table (5) also demonstrated a significant interaction between the two study factors. This interaction may be attributed to differences in the relative response of salicylic acid soaking treatments to foliar application of yeast extract. Under treatments S_0 and S_2 , a linear increase in the number of grains per row was observed with increasing yeast extract concentrations. In contrast, under treatment S_1 , the number of grains per row increased at Y_1 , decreased at Y_2 , and then increased again at Y_3 .

Table (5). Effect of Seed Soaking in Salicylic Acid, Foliar Application of Yeast Extract, and Their Interaction on the Mean Number of Grains per Row

Mean	Yeast Extract Concentrations (g.L-1)				Salicylic Acid (mg.L-1)
	Y_3	Y_2	Y_1	Y_0	
40.208 ^{ab}	48.840^{a}	41.687 ^{bcde}	37.810 ^{cdef}	32.497 ^{fg}	S_0
38.486 ^{b}	42.910 ^{abcd}	37.120 ^{defg}	42.687 ^{bcd}	31.227 ^{g}	S_1
41.807 ^{a}	46.540 ^{ab}	43.810 ^{abc}	41.207^{bcde}	35.670 ^{efg}	S_2
	46.097 ^{a}	40.872 ^{b}	40.568 ^{b}	33.131 ^{c}	**Mean**

• Different letters (a, b, c, d, e, f, g) indicate the significant differences among the means of each treatment.

500-Grain Weight (g)

The data in Table (6) indicated that treatment Y_3 produced the highest mean 500-grain weight (**173.88 g**), while treatment Y_0 recorded the lowest mean value (**146.63 g**). This increase may be attributed to the superior performance of this treatment in terms of leaf area (**659.80 cm^2**) and total chlorophyll content (**1.322 mg g^{-1}**) compared with the other treatments. Furthermore, yeast extract contains cytokinins, which delay leaf senescence, thereby prolonging the photosynthetic period and increasing the production of assimilates in the leaves. These assimilates are subsequently translocated to the grains, enhancing grain filling and increasing grain weight.

The results in Table (6) also demonstrated a significant interaction between the two study factors for this trait. This interaction may be attributed to differences in the relative response of salicylic acid soaking treatments to foliar application of yeast extract. Under treatment S_0 , a linear increase in 500-grain weight was observed with increasing yeast extract concentrations. Under treatment S_1 , 500-grain weight increased at Y_1 , then decreased at Y_2 , and increased again at Y_3 . In contrast, treatment S_2 exhibited a different response pattern, with a decrease in 500-grain weight at Y_1 , followed by an increase at Y_2 and a subsequent decrease at Y_3 .

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Table (6). Effect of Seed Soaking in Salicylic Acid, Foliar Application of Yeast Extract, and Their Interaction on the Mean 500-Grain Weight (g)

Mean	Yeast Extract Concentrations (g.L-1)				Salicylic Acid (mg.L-1)
	Y_3	Y_2	Y_1	Y_0	
162.92 [a]	194.93 [a]	171.80 [ab]	155.14 [bc]	129.76 [cd]	S_0
160.67 [a]	170.13[ab]	160.33 [b]	175.61 [ab]	124.57[d]	S_1
165.81 [a]	156.58 [bc]	166.67[ab]	161.77[b]	178.21 [ab]	S_2
	173.88 [a]	166.29 [a]	164.17 [a]	146.63 [b]	Mean

• Different letters (a, b, c, d) indicate the significant differences among the means of each treatment.

Grain Yield (t ha^{-1})

The data in Table (7) showed that treatment S_2 produced the highest mean grain yield (**6.183 t ha^{-1}**), representing an increase of **23.64%** over treatment S_1, which recorded the lowest mean (**5.001 t ha^{-1}**). The increase in grain yield under treatment S_2 may be attributed to its superiority in the number of rows per ear and the number of grains per row, in addition to producing the highest mean 500-grain weight, despite the absence of significant differences between treatments for this trait (Tables 4, 5, and 6, respectively).

The same table also shows that treatment Y_3 achieved the highest mean grain yield (**6.392 t ha^{-1}**), with an increase of **47.49%** compared with treatment Y_0, which recorded the lowest mean (**4.334 t ha^{-1}**). This improvement may be attributed to the superiority of treatment Y_3 in producing the highest mean number of rows per ear (Table 4), number of grains per row (Table 5), and 500-grain weight (Table 6).

Table (7) further demonstrates a significant interaction between the two study factors. This interaction may be attributed to differences in the relative response of salicylic acid soaking treatments to foliar application of yeast extract. Under treatments S_0 and S_1, grain yield increased progressively up to treatment Y_1, decreased at Y_2, and then increased again at Y_3. In contrast, treatment S_2 exhibited a different response pattern, showing a linear increase in grain yield up to Y_2, followed by a decline at Y_3.

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Table (7). Effect of Seed Soaking in Salicylic Acid, Foliar Application of Yeast Extract, and Their Interaction on Mean Grain Yield (t ha^{-1})

Mean	Yeast Extract Concentrations (g.L-1)				Salicylic Acid (mg.L-1)
	Y_3	Y_2	Y_1	Y_0	
5.798 [a]	6.954 [ab]	5.456 [cdef]	6.590 [abcd]	4.193 [fg]	S_0
5.001 [b]	5.413 [cdef]	5.264 [defg]	5.406 [cdef]	3.919 [g]	S_1
6.183 [a]	6.809 [abc]	7.362 [a]	5.673 [bcde]	4.889 [efg]	S_2
	6.392 [a]	6.027 [a]	5.890 [a]	4.334 [b]	**Mean**

• Different letters (a, b, c, d, e, f, g) indicate the significant differences among the means of each treatment.

Shelling Percentage (%)

The data in Table (8) showed that treatment S_2 produced the highest mean shelling percentage (**85.241%**), which differed significantly from treatment S_1 , which recorded the lowest mean (**81.016%**).

The same table also indicates that treatment Y_3 recorded the highest mean shelling percentage (**83.993%**) compared with treatment Y_0 , which produced the lowest mean (**80.897%**). The superior performance of treatments S_2 and Y_3 may be attributed to increased photosynthetic activity and more efficient translocation of assimilates toward the grains rather than the cob tissues, resulting in higher grain yield without a corresponding increase in cob weight. Consequently, the average shelling percentage increased under both treatments (Table 9).

Table (8) further demonstrates a significant interaction between the two study factors. This interaction may be attributed to differences in the relative response of salicylic acid soaking treatments to foliar application of yeast extract. Under treatment S_0 , shelling percentage increased at Y_1 before gradually decreasing with increasing yeast extract concentrations. Under treatment S_1 , shelling percentage increased linearly up to Y_2 and then declined at Y_3 . In contrast, treatment S_2 exhibited a different response pattern, with shelling percentage decreasing at Y_1 before increasing again in a direct manner with increasing concentrations of yeast extract.

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Table (8). Effect of Seed Soaking in Salicylic Acid, Foliar Application of Yeast Extract, and Their Interaction on the Mean Shelling Percentage (%)

Mean	Yeast Extract Concentrations (g.L-1)				Salicylic Acid (mg.L-1)
	Y_3	Y_2	Y_1	Y_0	
82.630[b]	82.389[bc]	82.736[abc]	85.003 [ab]	80.394[bc]	S_0
81.016[b]	81.498 [bc]	83.682 [ab]	80.850 [bc]	78.036[c]	S_1
85.241[a]	88.093 [a]	84.961 [ab]	83.650 [ab]	84.263 [ab]	S_2
	83.993 [a]	83.793 [ab]	83.168 [ab]	80.897 [b]	Mean

• Different letters (a, b, c) indicate the significant differences among the means of each

Conclusions

Based on the obtained results, it can be concluded that corn plants exhibited a significant positive response to both seed soaking in salicylic acid and foliar application of yeast extract, as reflected by improvements in grain yield and its components. Seed soaking with salicylic acid at a concentration of 70 mg L^{-1} and foliar application of yeast extract at a concentration of 21 g L^{-1} were superior in enhancing most of the studied traits, particularly the total grain yield.

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