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(Original Article)

Impact of Foliar Spray by Salicylic Acid on Yield and its Attributes of Intercropped Soybean with Sorghum

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Abstract

A field experiment was conducted at Agricultural Research Station Farm in Shandaweel Island, Sohag Governorate to assess the intercropping for grain sorghum with soybean during 2020 and 2021 seasons under different systems about yield and its attributes of the two crops. The experiment was carried out in a randomized complete block design (RCBD) using strip plot arrangement with three replications.

The obtained results showed that foliar spray with salicylic acid and intercropping system enhanced significantly all studied soybean and sorghum traits in this study in both seasons. Thus, the highest mean values of previous measured traits were observed from plants that were sprayed with salicylic acid at the rate of 100 ppm of the two crops in the two successful seasons. In addition, maximum yield and its attributes of sorghum were produced from intercropping system of 2 rows sorghum: 2 rows soybean in both seasons. On the other hand, the maximum soybean yield and its related traits were obtained from intercropping system 1 sorghum: 1 soybean and 2 sorghum: 2 soybean of sorghum and in the first and second years, soybean respectively.

The greatest ratios of land equivalent (LER) which wear 1.33 and 1.67 in the two respective seasons) were obtained from 2 sorghum: 2 soybean intercropping system under 100 ppm salicylic acid. The greatest values of monetary advantage index (MAI) (6750.40 and 17000.80 LE in the first and second seasons, respectively) were recorded from intercropping system of 2 sorghum: 2 soybean under100 ppm salicylic acid.

Keywords: *Intercropping system, Soybean, Sorghum, Competitive relationships.*

Introduction

In order to close the gap between supply and demand for field crops like grains, legumes, oils and fodder, agricultural intensification is thought to be one of the simplest methods and one of the innovative answers. This is accomplished by using crop loading as one of the methods for crop intensification when new agricultural systems are introduced. This increases productivity by 10–15% while

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reducing water use 20% or so goes to irrigation and 20% or so goes to fertilizer supply. In order to boost agricultural productivity and improve the efficiency of agricultural resources through vertical growth employing loading as a mechanism, crop intensification has therefore become urgently necessary. Intercropping might positively impact on the future food problems in developing countries (Egbe, 2005). This may be through efficient use of solar energy and other growth resources. Also, optimization of land resource use could be achieved when crops are grown under intercropping and plant population density increased. Intercropping is receiving attention because it offers potential advantages for resource utilization, decreased inputs and increased sustainability in crop production, but our understanding of interactions among intercropped species is still very limited.

Plant hormone salicylic acid (SA) functions as an endogenous signal molecule that induces biotic tolerance to stress in plants (Gunes *et al.*, 2007).

In terms of total production and international trade, soybeans are the most significant grain legume crop worldwide. Egypt's soybean area has drastically shrunk due to fierce competition from strategic summer agricultural fields. Soybean is regarded as a crop with enormous potential for enhancing both human diet and animal feed and it is widely used as the raw material foundation for various industries.

After wheat, rice and maize in terms of production and acreage, grain sorghum comes in at 0.390 million faddan, is primarily grown in middle and Upper Egypt and is preceded by either legumes or non-legumes winter crops. All across the world, including Egypt, where the country's cereal production falls well short of the growing population's overall consumption, it is typically used for both food and feed. The objective for this research was to study the impact of foliar spray by Salicylic acid on yield and its attributes of intercropped soybean with sorghum.

Materials and Methods

The field experiment was carried out during 2020 and 2021 seasons at the Agricultural Research Station experimental Farm in Shandaweel Island, Sohag Governorate to evaluate the effect of foliar spray by salicylic acid on the yield and its attributes of intercropped soybean with sorghum.

The soil analysis of the experimental site is illustrated in Table 1. Sowing sorghum (Var. Dorado) was done on 11th and 12th of June in 2020 and 2021 seasons, respectively. While planting soybean (Var. Giza-111) was done on 14th and 15th of June in 2020 and 2021 seasons, respectively. The experiment was carried out in a randomized complete block design (RCBD) using strip plot arrangement with three replications.

Table 1. Some physical and chemical properties of the experimental soil

Soil depth cm	pH 1:1 suspension	EC 1:1 Extract Dsm^{-1}	CaCO %	Soluble cations meq/100 g soil				Soluble anions meq/100 g soil	
				Ca^{+2}	Mg^{+2}	Na^{+2}	K^{+1}	CO_3 and HCO_3	Cl
0-15	8.21	0.66	8.02	0.31	0.26	0.09	0.01	0.31	0.30
15-30	8.33	0.71	8.00	0.25	0.22	0.07	0.04	0.32	0.30
30-45	8.27	0.69	8.11	0.30	0.25	0.10	0.03	0.30	0.27
45-60	8.31	0.71	8.25	0.33	0.20	0.08	0.02	0.28	0.25

Soil depth cm	Available nutrients Ppm			Mechanical analysis %			Soil texture
	N	P	K	Sand	Silt	Clay	
0-15	160	3.48	110	66.3	28.0	5.7	Sandy loam
15-30	90	4.15	128.7	66.3	28.0	5.7	
30-45	88	3.58	111.6	64.7	29.2	6.1	
45-60	102	3.12	109.2	61.9	30.4	7.7	

Each plot consisted of 6 rows (3m length and 0.6 m width, plot area was 10.8 m^2). The first variable was the foliar sprays compounds which occupied horizontally as follows:

A. Control (water spray).

B. Salicylic acid 50 ppm.

C. Salicylic acid 100 ppm.

The salicylic acid spraying treatments were applied at 35 and 45 days after sowing in both seasons. The second variable was intercropping system treatments which consisted of:

1- Sole soybean.
2- Sole sorghum.
3- 1 Sorghum: 1 Soybean.
4- 2 Sorghum: 2 Soybean.
5- 2 Sorghum: 1 Soybean.

Measured traits

Soybean yield and its attributes

From each experimental unit, three plants were chosen at random, and the following characteristics were identified:

1- Number of branches/plant.
2- Number of pods/plant.
3- Number of seeds/pod.
4- 100-seed weight (g).
5- Seed yield (kg/fed.).

Sorghum yield and its attributes traits

From each experimental unit, five plants were chosen at random, and the following characteristics were identified:

1- Panicle length (cm).
2- Panicle width (cm).
3- Panicle weight (g).
4- Panicle grain weight (g).
5- 1000- grain weight (g).
6- Grain yield (kg/fed.).

Competitive relationships traits

1-Land equivalent ratio (LER)

The ratio of area needs under solid cropping to that of intercropping at the same management level to produce an equivalent yield, according to Mead and Willey (1980)

$$\text{LER} = (\text{Y ab}/\text{Y aa}) + (\text{Y ba}/\text{Y bb})$$

where, Y aa and Y bb are the solid crop yields of crops a and b, respectively, Yab is the intercrop yield of crop a, and Yba is the intercrop yield of crop b.

2-Competitive ratio (CR)

The number of times that one component crop is more competitive than the other is indicated by the competitive ratio. Competitive ratios are frequently used to assess relative species competition.

$$\text{CR sorghum} = (\text{LER sorghum} / \text{LER soybean})\ (\text{Z ba} / \text{Z ab})$$

$$\text{CR soybean} = (\text{LER soybean} / \text{LER sorghum})\ (\text{Z ab} / \text{Z ba})$$

where, in the sorghum/soybean intercrop, Z ba represents the proportion of soybean that is sown and Z ab represents the proportion of sorghum that is sown.

3-Aggressivity (Agg)

Another metric that's frequently used to show how much the relative yield increase of crop 'a' is higher than that of crop 'b' in an intercropping system is called aggression. The formulation of the aggressiveness followed **Dhima *et al.*** (2007)

$$\text{A sorghum} = (\text{Y ab} / \text{Y a} \times \text{Z ab}) - (\text{Y ba} / \text{Y b} \times \text{Z ba})$$

$$\text{A soybean} = (\text{Y ba} / \text{Y b} \times \text{Z ba}) - (\text{Y ab} / \text{Y a} \times \text{Z ab})$$

If A sorghum = 0, both crops are equally competitive,

If A sorghum is positive, then the sorghum is dominant,

If A sorghum is negative, then the sorghum is subordinate.

Economic assessment

4-Monetary advantage index (MAI)

Suggests that the value of the land saved should be considered when making an economic assessment; this value is likely to be best determined by considering how rentable the land is. MAI was calculated using the following formula, which was suggested by Willey (1979)

$$\text{MAI} = \text{Value of combined intercrops} \times \text{LER} - 1 \,/\, \text{LER}.$$

Gross return (LE/fed)

At market prices of 10896 and 15570 LE/ton for sorghum grains and 11165 and 9540 LE/ton for soybean seeds in the 2020 and 2021 growing seasons, respectively, the gross return from each treatment was calculated in Egyptian pounds (LE).

Statistical analysis

Collected data were analyzed by MSTAT-C (1991) software package according to Gomez and Gomez (1984). Means were compared using revised Least Significant Difference (RLSD) at 5% level of significant (Steel and Torrie, 1981).

Results and Discussion

1-Sorghum yield and its attributes traits

Illustrated data in Table 2. show that foliar spray by salicylic acid affected significantly panicle length (cm), panicle width (cm), panicle weight (g), panicle grain weight (g), 1000- grain weight (g) and grain yield (kg/fed.) in both seasons. Sorghum plants that were sprayed with 100 ppm Salicylic acid exceeded the control and 50 ppm treatments in all previous measured traits in the present study. As the greatest average values had been 32.98 cm for panicle length, 6.65 cm for panicle width, 92.07 g for panicle weight, 77.00 g for panicle grain weight, 33.22 g for 1000- grain weight and 1885.92 kg/fed. for grain yield in the first-year season while, in the second-year season the greatest average values were 33.53 cm for panicle length, 6.99 cm for panicle width, 94.78 g for panicle weight, 82.68 g for panicle grain weight, 33.45 g for 1000- grain weight and 2084.67 kg/fed. for grain yield. The previous findings attributes to the role of salicylic acid for enhancement growth and reduce the harmful effects of biotic and abiotic stress which led to high photosynthesis process and accumulated high products in plants and consequently increased grain yield and its attributes. The results obtained are consistent with those attained by Said and Hamd-Alla (2018) and Ahmad *et al*. (2018).

Furthermore, the previous data in the same table denote that panicle length (cm), panicle width (cm), panicle weight (g), panicle grain weight (g), 1000-grain weight (g) and grain yield (kg/fed.) of sorghum were affected significantly by intercropping systems in both seasons. Intercropped sorghum with soybean as 2 sorghum: 1 soybean gained the highest average values of panicle length (cm), panicle width (cm) ,1000- grain weight (g) and grain yield (kg/fed.) in both seasons. Thus, the greatest mean values of grain yield (1762.02 and 1956.78 in the two respective seasons) were obtained from intercropping system of 2 sorghum: 2 soybean. On the other hand, the highest mean value of panicle weight in the first season was obtained from intercropping system 2 sorghum: 1 soybean while the corresponding value in this respect was recorded from 2 sorghum: 2 soybean.

Table 2. Means of sorghum traits as affected by intercropping soybean with grain sorghum and foliar spray by salicylic acid in 2020 and 2021 seasons

Intercropping systems	Salicylic acid	Panicle length		Panicle width		Panicle weight		Panicle grain weight		1000- grain weight		grain yield (kg/fed.)	
		Season 2020	Season 2021	Season 2020	Season 2021	Season 2020	Season 2021	Season 2020	Season 2021	Season 2020	Season 2021	Season 2020	Season 2021
1 Sorghum: 1 Soybean	Control	30.27	31.17	5.27	5.67	85.47	89.33	69.27	74.67	28.00	29.40	1081.74	1151.33
	50 ppm	31.27	32.10	5.73	6.2	86.60	90.98	70.73	75.93	30.00	30.53	1188.32	1418.32
	100 ppm	31.80	32.43	6.27	6.67	89.53	92.53	72.67	78.27	31.47	31.20	1304.67	1534.67
Mean		31.11	31.90	5.76	6.18	87.20	90.95	70.89	76.29	29.82	30.38	1191.58	1368.11
2 Sorghum: 2Soybean	Control	31.60	31.23	5.87	6.33	87.60	89.67	73.87	78.93	30.47	30.80	1696.87	1821.15
	50 ppm	32.00	31.63	6.20	6.53	88.87	93.13	75.97	81.73	31.93	32.07	1710.53	1940.53
	100 ppm	33.07	33.77	6.67	7	92.33	94.67	78.00	83.53	33.60	33.47	1878.67	2108.67
Mean		32.22	32.21	6.25	6.62	89.60	92.49	75.95	81.40	32.00	32.11	1762.02	1956.78
2 Sorghum: 1 Soybean	Control	31.80	32.43	5.93	6.33	87.77	91.81	74.53	80.07	30.73	31.07	1677.21	1811.47
	50 ppm	32.20	32.90	6.13	6.4	89.30	93.40	76.60	82.53	32.07	31.93	1739.07	1969.07
	100 ppm	33.33	33.70	6.67	7.07	92.60	94.53	77.40	82.80	33.93	34.13	1865.33	2095.33
Mean		32.44	33.01	6.24	6.60	89.89	93.25	76.18	81.80	32.24	32.38	1760.54	1958.62
Sole	Control	31.53	32.87	6.23	6.6	88.53	90.93	76.20	82.73	31.07	31.93	2170.00	2305.00
	50 ppm	32.53	33.30	6.53	6.73	91.00	94.33	77.90	84.07	32.20	33.93	2368.33	2490.00
	100 ppm	33.73	34.20	7.00	7.2	93.80	97.40	79.93	86.13	33.87	35.00	2495.00	2600.00
Mean		32.60	33.46	6.59	6.84	91.11	94.22	78.01	84.31	32.38	33.62	2344.44	2465.00
Main effect of salicylic acid	Control	31.30	31.93	5.83	6.23	87.34	90.44	73.47	79.10	30.07	30.80	1656.46	1772.24
	50 ppm	32.00	32.48	6.15	6.47	88.94	92.96	75.30	81.07	31.55	32.12	1751.56	1954.48
	100 ppm	32.98	33.53	6.65	6.99	92.07	94.78	77.00	82.68	33.22	33.45	1885.92	2084.67
F test + LSD 0.05	A	0.22**	0.17**	0.25**	0.11**	0.12**	0.32**	0.81**	0.12**	0.77**	0.29**	0.60**	3.58**
	B	0.27**	0.36**	0.38**	0.19**	0.12**	0.21**	0.51**	0.77**	0.55**	0.37**	0.46**	8.78**
	AB	0.32**	0.37**	0.61**	ns	0.19**	0.72*	0.82**	0.43**	0.90**	0.54*	0.75*	11.39**

NS, * and ** means not significant, significant at 0.05 and 0.01 probability, respectively.

Here too, the interaction between salicylic acid concentrations and intercropping system had a significant effect in all evaluated traits in this respect in both seasons. Thus, the greatest mean values were 33.33 cm for Panicle length, 6.67 cm for panicle width, 92.60 g for panicle weight, 78.00 g for panicle grain weight, 33.93 g for 1000- grain weight and 1878.67 kg/fed. for grain yield in the first season were obtained from grain sorghum plants which was intercropped with soybean as 2:2 and sprayed with salicylic acid by the rate of 100 ppm, except 92.60 g for panicle weight which was intercropped with soybean as 2:2. while, in the second season the highest average values were 33.77 cm for panicle length, 7.07 cm for panicle width, 94.67 g for panicle weight, 83.53 g for panicle grain weight, 34.13 g for 1000- grain weight and 2108.67 kg/fed. for grain yield.

2-Soybean Yield and its attributes

The Illustrated data in Table 3. indicate that salicylic acid foliar spray had a significant impact number of branches/plant, number of pods/plant, number of seeds/pod, 100-seed weight (g) and Seed yield/fad (kg/fed.) in both seasons. Soybean plants which were sprayed by 100 ppm salicylic acid exceeded the control and 50 ppm treatments in all previous measured traits in this study. As the highest mean values were 5.00 for number of branches/plant, 158.33 for number of pods/plant, 2.82 for number of seeds/pod, 20.18g for 100-seed weight and 897.58 kg for seed yield/fed (kg/fed.) in the first season, while in the second season the highest average values were 5.58 for number of branches/plant, 166.59 for number of pods/plant, 2.87 for number of seeds/pod, 21.38 g for 100-seed weight and 1092.58 kg for seed yield/fad (kg/fed.). The previous findings attributes to the role of salicylic acid for enhancement growth and reduce the harmful effects of biotic and abiotic stress which led to high photosynthesis process and accumulated high products in plants and consequently increased seed yield and its attributes. Similar findings were published in the works of Bakry *et al*. (2013), Farhadi *et al*. (2017) and Noreen *et al*. (2017).

In addition, the previous data in the same table denote that number of branches/plant, number of pods/plant, number of seeds/pod, 100-seed weight (g) and seed yield/fad (kg/fed.) of soybean were affected significantly by intercropping systems in both seasons. Intercropped soybean with sorghum as 2 sorghum: 2 soybean gained the highest average values of number of branches/plant, number of pods/plant, number of seeds/pod, 100-seed weight (g) and seed yield/fad (kg/fed.) in both seasons. Thus, the highest mean value of seed yield 767.89 and 902.49 kg/fed. were obtained from intercropping system of 1 sorghum: 1 soybean. The taller maize plants beneath the intercropping patterns also provide shade. According to studies by Zhuang and Yu-Bi (2013) and Polthanee and Trelo-ges (2003), this shading may lower the photosynthetic rate of the lower growing plants and consequently lower their yields.

Also, all traits that were studied in this regard in both seasons were significantly impacted by the interaction between salicylic acid concentrations and the intercropping system except for number of seeds/pod. Thus, the

highest mean values were 4.87 for number of branches/plant, 160.00 for number of pods/plant, 2.87 g for number of seeds/pod, 20.40 g for 100-seed weight and 835.33 kg/fed. for seed yield/fed in the first-year season were obtained from grain soybean plants which were intercropped with soybean as 2sorghum: 2soybean and sprayed with salicylic acid by the rate of 100 ppm, except for seed yield/fed. the highest mean values was 835.33 kg/fed, were obtained from grain soybean plants which were intercropped with soybean as 1sorghum:1soybean. While in the second-year season, the highest average values were 5.73 for number of branches/plant, 168.67 for number of pods/plant, 2.93 for number of seeds/pod, 21.47 g for 100-seed weight and 1000.33 kg/fed. for seed yield/fed.

Table 3. Mean of soybean traits as affected by intercropping soybean with grain sorghum and foliar spray by salicylic acid in 2020 and 2021 seasons

Intercropping systems	Salicylic acid	No. of branches/plant		No. of pods/plant		No. of seeds/pod		100-seed weight		Seed yield/fed (kg/fed.)	
		Season 2020	Season 2021	Season 2020	Season 2021	Season 2020	Season 2021	Season 2020	Season 2021	Season 2020	Season 2021
1 Sorghum: 1 Soybean	Control	2.80	3.53	134.33	151.67	2.53	2.73	17.40	19.30	688.87	808.13
	50 ppm	4.20	4.67	145.33	157.33	2.67	2.80	18.20	19.87	779.47	911.00
	100 ppm	4.73	5.07	154.33	161.67	2.73	2.80	19.73	20.60	835.33	988.33
Mean		3.91	4.42	144.66	156.89	2.64	2.78	18.44	19.92	767.89	902.49
2 Sorghum: 2Soybean	Control	3.73	4.07	142.67	154.33	2.67	2.67	18.00	19.87	501.73	613.33
	50 ppm	4.33	5.27	150.00	161.33	2.73	2.87	18.87	20.60	533.53	913.33
	100 ppm	4.87	5.73	160.00	168.67	2.87	2.93	20.40	21.47	603.33	1000.33
Mean		4.31	5.02	150.89	161.44	2.76	2.82	19.09	20.65	546.20	842.33
2 Sorghum: 1 Soybean	Control	3.07	3.87	134.33	148.67	2.33	2.47	17.40	19.33	460.13	577.67
	50 ppm	3.40	4.73	142.33	153.33	2.53	2.60	18.20	20.00	509.07	651.67
	100 ppm	4.40	5.20	149.67	158.33	2.67	2.73	18.87	20.93	580.00	710.00
Mean		3.62	4.60	142.11	153.44	2.51	2.60	18.16	20.09	516.40	646.45
Sole	Control	4.00	5.13	150.00	163.33	2.80	2.93	19.00	21.47	1300.00	1343.33
	50 ppm	5.17	5.40	158.00	168.67	3.00	3.00	20.20	22.83	1441.67	1581.67
	100 ppm	6.00	6.33	169.33	177.67	3.00	3.00	21.70	22.53	1571.67	1671.67
Mean		5.06	5.62	159.11	169.89	2.93	2.98	20.30	22.28	1437.78	1532.22
Main effect of salicylic acid	Control	3.40	4.15	140.33	154.50	2.58	2.70	17.95	19.99	737.68	835.62
	50 ppm	4.28	5.02	148.92	160.17	2.73	2.82	18.87	20.83	815.94	1014.42
	100 ppm	5.00	5.58	158.33	166.59	2.82	2.87	20.18	21.38	897.58	1092.58
F test + LSD 0.05	A	0.05**	0.26**	0.78**	1.12**	0.08**	0.06**	0.21**	0.18**	4.83**	7.47**
	B	0.29**	0.26**	1.99**	1.22**	0.15**	0.10**	0.50**	0.38**	5.70**	7.34**
	AB	0.35**	ns	2.13**	1.99**	ns	ns	0.40**	0.62**	11.37**	11.91**

NS, * and ** means not significant, significant at 0.05 and 0.01 probability, respectively.

3-Impact of intercropping grain sorghum and soybean on competitive relationships:

1. Land Equivalent Ratio (LER):

Results in Tables 4 and 5 show that LER values were greater than one in both seasons. The results also denote that 1.33 and 1.67 were the greatest land equivalent ratios (LER) in both seasons when intercropping system treatments of 2 sorghum: 2 soybean. This indicates that LER increased by 33% and 67% in both seasons. The same outcomes were reported by Selim and Shams (2019), Hamd-Alla *et al*. (2020) and Selim *et al*. (2020-a). These findings are consistent with those of El-Sherif and Ali (2015), Gadallah and Gabra (2015), and Abou-Elela *et al*. (2012). when they observed that, when compared to solid plantings of maize and soybean, intercropping patterns generally increased LER values and

recorded yield advantages. When LER is equal to one, it suggests that there is actually no yield advantage, but when LER is greater than one, it indicates that currently is a yield advantage, as reported by Jabbar *et al*. (2009).

2. Aggressivity (Agg)

The data in Tables 4 and 5 show that of soybean was dominated while sorghum was dominant at intercropping system treatments. 2 sorghum: 2 soybean. When sorghum and soybean were intercropped, differing aggressivity values between dominant and dominated crops were seen. A comparable result has been reported by Ghosh *et al* (2006).

3. Competitive ratio (CR).

Results in Tables 4 and 5 showed that the larger values competitive ratio (CR) of soybean was 1.09 when intercropping system treatments 1 sorghum: 1 soybean in variable was the foliar sprays, while sorghum was 1.10 when intercropping when intercropping system treatments 2 sorghum: 1 soybean in variable were the foliar spray. It is noteworthy that maize values for the competitive ratio were lower compared to values for soybean suggests that soybean were more competitive than maize this is significant Abou-Elela *et al*. (2012), however, published findings to the contrary.

4.Monetary advantage index (MAI)

Results in Tables 4 and 5 showed that the highest MAI values were 6750.40 and 17000.80, respectively, in both seasons. From whom they were acquired grain soybean plants that were intercropped with soybean as 2:2 and sprayed with salicylic acid at the rate of 100 ppm. The previous results are in same line with those obtained by Abou-Keriasha *et al*. (2012) and Hamd Alla *et al*. (2014) who's stated that economic benefit expressed with the higher MAI values in intercropping.

Table 4. The first-season interaction between the intercropping systems and foliar spray means competitive relationships and yield advantage

Season 2020											
Salicylic acid	**Intercropping**	**Soy grain yield**	**Sorghum grain yield**	**LER Soy**	**LER Sor**	**Total LER**	**Ag Soy**	**Ag Sor**	**CR Soy**	**CR Sor**	**MAI**
Control	1 Sor : 1 Soy	688.87	1081.74	0.53	0.50	1.03	0.06	-0.06	1.06	0.94	567.32
	2 Sor : 2 Soy	501.73	1696.87	0.39	0.78	1.17	-1.20	1.20	1.00	1.00	3500.39
	2 Sor : 1 Soy	460.13	1677.21	0.35	0.77	1.13	-1.27	1.27	0.91	1.10	2693.44
50 ppm	1 Sor : 1 Soy	779.47	1188.32	0.60	0.55	1.15	0.10	-0.10	1.09	0.92	2824.01
	2 Sor : 2 Soy	533.53	1710.53	0.41	0.79	1.20	-1.15	1.15	1.04	0.96	4099.13
	2 Sor : 1 Soy	509.07	1739.07	0.39	0.80	1.19	-1.24	1.24	0.98	1.03	3932.95
100 ppm	1 Sor : 1 Soy	835.33	1304.67	0.64	0.60	1.24	0.08	-0.08	1.07	0.94	4556.54
	2 Sor : 2 Soy	603.33	1878.67	0.46	0.87	1.33	-1.22	1.22	1.06	0.95	6750.40
	2 Sor : 1 Soy	580	1865.33	0.45	0.86	1.31	-1.25	1.25	1.05	0.96	6342.06
Sol		1300	2170								

Table 5. The second-season interaction between the intercropping systems and foliar spray means competitive relationships and yield advantage

Season 2021											
Salicylic acid	**Intercropping**	**Soy grain yield**	**Sorghum grain yield**	**LER Soy**	**LER Sor**	**Total LER**	**Ag Soy**	**Ag Sor**	**CR Soy**	**CR Sor**	**MAI**
Control	1 Sor : 1 Soy	808.13	1151.33	0.59	0.52	1.11	0.13	-0.13	1.13	0.88	2540.482
	2 Sor : 2 Soy	613.33	1821.15	0.44	0.82	1.26	-1.14	1.14	1.07	0.93	7058.479
	2 Sor : 1 Soy	577.67	1811.47	0.42	0.82	1.24	-1.20	1.20	1.02	0.98	6525.592
50 ppm	1 Sor : 1 Soy	911.00	1418.32	0.66	0.64	1.30	0.04	-0.04	1.03	0.97	7101.734
	2 Sor : 2 Soy	913.33	1940.53	0.66	0.87	1.53	-0.64	0.64	1.52	0.66	13484.59
	2 Sor : 1 Soy	651.67	1969.07	0.47	0.89	1.36	-1.26	1.26	1.06	0.95	9761.123
100 ppm	1 Sor : 1 Soy	988.33	1534.67	0.72	0.69	1.41	0.05	-0.05	1.04	0.96	9689.81
	2 Sor : 2 Soy	1000.33	2108.67	0.72	0.95	1.67	-0.68	0.68	1.52	0.66	17000.80
	2 Sor : 1 Soy	710.00	2095.33	0.51	0.94	1.45	-1.30	1.30	1.09	0.92	12226.87
Sol		1343.33	2305								

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تأثير الرش الورقي بحامض الساليسليك على المحصول ومساهماته عند تحميل فول الصويا مع الذرة الرفيعة

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الملخص

اقيمت تجربة حقلية بمزرعة محطة البحوث الزراعية بجزيرة شندويل بمحافظة سوهاج لتقييم تحميل فول الصويا والذرة الرفيعة تحت انماط مختلفة من التحميل على المحصول ومساهماته لكلا المحصولين خلال موسمي 2020 و2021 كان التصميم المستخدم هو تصميم القطاعات العشوائية الكاملة (RCBD) مرتبة في شرائح منشقة بثلاثة مكررات. أوضحت النتائج أن الرش الورقي بحامض السالسيليك تحت نظم التحميل المختلفة أدى إلى زيادة معنوية لجميع الصفات في الدراسة لكلا الموسمين (الذرة الرفيعة وفول الصويا). كما لوحظ ان أعلى متوسطات الصفات المقاسة في النباتات هي التي تم رشها بحامض السالسيليك بمعدل 100 جزء في المليون لكلا المحصولين في الموسمين. كانت أقصى انتاجية للمحصول ومساهماته للذرة الرفيعة تحت نظام التحميل2 خط ذرة رفيعة: 2 خط فول صويا لكلا الموسمين. علي الجانب الاخر كانت أقصى انتاجيه للمحصول ومساهماته لفول الصويا تحت نظم التحميل 1ذرة رفيعة: 1 صويا و2 ذرة رفيعة: 2فول صويا في الموسم الأول والثاني على التوالي. وقد بلغ معدل استغلال الأرض 1.33 و1.67 في الموسمين على التوالي تحت نظام التحميل 2 ذرة رفيعة: 2 فول صويا عند الرش الورقي بحمض السالسيليك بمعدل 100 جزء في المليون. كما كانت أعلى قيمة لدليل الميزة النقدية 6750.40 و17000.80 عند نظام التحميل 2 ذرة الرفيعة: 2 فول صويا في الموسمين على التوالي عند الرش الورقي بحمض السالسيليك بمعدل 100 جزء في المليون.