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Effect of different insecticides against thrips in onion

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ABSTRACT

The present experiment was conducted with the objective to find out the effect of different insecticides for the control of thrips in the onion crop. The result show that overall average lowest thrips population (7.31 nymphs/plant) as were recorded in T2 treatment (1st spray Imidacloprid @ 0.5 ml/L + Copper oxychloride @ 3.0 g/L, 2nd spray Lambdacyhalothrin @ 1.0 ml/L + Carbendazim @ 2.0 g/L, 3rd spray Fipronil @ 1.0 ml/L + Carbendazim @ 2.0 g/L, 4th spray Profenophos @ 2.0 ml/L + Carbendazim @ 2.0 g/L,5th spray Spinosad @ 0.3 ml/L + Copper oxychloride @ 3.0 g/L) and highest gross and marketable yield (336.64 q/ha and 328.85 q/ha) were also recorded in same treatment applying four sequential sprays to keep control thrips population and diseases .The highest ICBR (1:6.69) was also recorded in the treatment (T_2).The highest thrips population as well as the lowest yield was recorded in the control treatment.

Keywords: *Onion, different insecticides, fungicides, thrips, management, gross yield kg/plot and q/ha, marketable yield kg/plot and q/ha.*

INTRODUCTION

Onion (*Allium cepa* L.) is the most important commercial bulb crop grown all over the world and consumed in various forms. It is generally used fresh, spices, as important elements of the Mediterranean diet and as medicines .In India, onion is cultivated in 3 seasons, ie, *rabi, kharif* and *late kharif* seasons, and the maximum area under cultivation is covered in the *rabi* season (about 60-65%). In India, onion production in the previous year (2023-24) was 242.67 lakh tonnes and India's Ministry of Agriculture's first advance estimate for the 2024-25 crop year (ending June 2025) projects a significant increase in onion production to 288.77 lakh tonnes, a 19% rise from the previous year's 242.67 lakh tonnes. This higher output, supported by increased Rabi-2024 crop production of 191 lakh tonnes, is expected to meet domestic demand and facilitate price stability despite policy changes, according to the Ministry of Agriculture and Farmers Welfare. Onion thrips (*Thrips tabaci* Lindeman (Thysanoptera: Thripidae)) are an important insect damaging the onion crop. Uncontrolled infestation causes loss of green leaf tissue and yields. In addition, onion thrips feeding on onion bulbs lowers their quality and value for export. Onion thrips is a polyphagous pest that causes serious damage to vegetables and ornamentals all over the world, as reported by Murai (2000)[12].Its population is usually high on plants fromthe *Alliaceae* family, especially on onion (*Allium cepa L.*).The nymphs and adults feed mostly on green leaf tissue, causing direct damage by destroying epidermal cells. They feed by piercing the surface tissue and imbibing exuded cellular contents. Srinivas and Lawande (2004)[23] reported that *Thrips tabaci* could cause yield loss in the range of 46-87% in onion. Waiganjo *et. al.* (2008)[30] estimated the foliage damage of the crop to be around 40-60% yield losses of 10-20% in the crop. Shibru and Negeri (2014)[25] reported that onion thrips cause damage tothe yield, 23-85%. Onion thrips are an important vector also for several plant viruses such as tomato spotted wilt virus (Kritzman *et. al.*, 2002)[6]. Failure to control this pest by timely and effective means causes considerable damage and results in immense economic loss due to remarkably reduced yield (Anonymous 2000, Jaun, 2002)[2][5]. Insecticides are a major tool for thrips control, but this strategy is inadequate and unsustainable (Maniania*et. al.,* 2003)[13] because thrips have developed resistance towards various groups of insecticides (Lebedev *et. al.*, 2013)[10]. Pandey *et. al.* (2020)[17] reported that the sequential spray of different insecticides significant effect in reducing the number of onion thrips. Pathak *et.al.,* (2020)[18] reported that spray of spinosad@0.3ml/L at 10-day intervals was effective for the control of onion thrips. Shweta *et. al., (*2019)[24] reported that thiamethoxam 25WG@25g ai./ha is effective forthe control of onionthrips. According to Gangwar*et. al.*(2016)[4], insecticides alongwith surfactant reduced the thrips damage severity and increased the bulb yield compared with the insecticides without surfactant. Pathak *et. al.,* (2021)[19] reported that spray of Fipronil @1.0ml/L + silica-based surfactant@0.5ml/L at 15-day intervals was effective for control of onion thrips and increased the onion yield as well as the quality of onion. Pathak *et. al.* (2018)[20] reported that the lowest thrips population and highest onion seed yield were recorded with the application of fipronil insecticides. Tirkey *and* Kumar (2017), KurbettA *et. al.* (2015)[28][8] reported that thiamethoxam was proven to be the most effective for thrips control.

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Asgar *et. al.* (2018) [1] suggested that the insecticides reduced the thrips population compared to the control, and the highest yield was obtained by the use of Dimethoate. Kumar and Singh (2011), Das *et .al.,* (2017)[9] [3]reported that sprays of Imidacloprid given at a 15-days interval recorded the lowest thrips population and gave the highest gross yield. Pandey *et al.* (2013)[21] reported that the lowest thrips population and the highest bulb yield were obtained by applying fipronil. Patil and Patil (2018) [22] reported that fipronil was the most effective for control of onion thrips and recorded the highest yield. Shitole *et. al.*, (2002) [26] reported that the lowest thrips population and highest onion seed yield were recorded with the application of fipronil insecticides.

MATERIALS AND METHODS

A field experiment was conducted at the Regional Research Station, National Horticultural Research and Development Foundation (NHRDF), Karnal, Latitude 29.7452° N, and Longitude 76.9949° E, 243m above MSL, Haryana, India, in two consecutive years during *rabi* 2022-23 and 2023-24. The seedlings of onion variety NHRDF Red were transplanted in a bed size of 3x1.2 m at 15 cm x 10 cm spacing. Randomised Block Design with 3 replications was followed. The treatments evaluated were $T_{1,}$1st spray-Lambdacyhalothrin @ 1.0 ml/L + Carbendazim @ 2.0 g/L, 2nd spray-Spinosad @ 0.3 ml/L + Copper oxychloride @ 3.0 g/L, 3rd sprayProfenophos @ 2.0 ml/L + Carbendazim @ 2.0 g/L),4th sprayImidacloprid @ 0.5 ml/L + Copper oxychloride @ 3 g/L,5th spray Fipronil @ 1 ml/L + Carbendazim @ 2 g/L,T_2,1st sprayImidacloprid @ 0.5 ml/L + Copper oxychloride @ 3.0 g/L, 2nd sprayLambdacyhalothrin @ 1.0 ml/L + Carbendazim @ 2.0 g/L, 3rd sprayFipronil @ 1.0 ml/L + Carbendazim @ 2.0 g/L, 4th spray Profenophos @ 2.0 ml/L + Carbendazim @ 2.0 g/L,5th spray Spinosad @ 0.3 ml/L + Copper oxychloride @ 3.0 g/L,$T_3$1st sprayFipronil @ 1.0 ml/L + Carbendazim @ 2.0 g/L, 2nd sprayImidacloprid @ 0.5 ml/L + Copper oxychloride @ 3.0 g/L, 3rd spraySpinosad @ 0.3 ml/L + Copper oxychloride @ 3.0 g/L ,4th spray Lambdacyhalothrin @ 1.0 ml/L + Carbendazim @ 2.0 g/L,5th spray Profenophos @ 2.0 ml/L + Carbendazim @ 2.0 g/L,T4 1st spraySpinosad @ 0.3 ml/L + Copper oxychloride @ 3.0 g/L, 2nd sprayProfenophos @ 2.0 ml/L + Carbendazim @ 2.0 g/L + 3rd spray Lambdacyhalothrin @ 1.0 ml/L + Carbendazim @ 2.0 g/L, 4th sprayFipronil @ 1.0 ml/L + Carbendazim @ 2.0 g/L, 5thspraySpinosad @ 0.3 ml/L + Copper oxychloride @ 3.0 g/L, T51st sprayProfenophos @ 2.0 ml/L + Carbendazim @ 2.0 g/L, 2nd sprayFipronil @ 1.0 ml/L + Carbendazim @ 2.0 gm/L, 3rd sprayImidacloprid @ 0.5 ml/L + Copper oxychloride @ 3.0 gm/L,4th spray Spinosad @ 0.3 ml/L + Copper oxychloride @ 3.0 g/L,5th spray Lambdacyhalothrin @ 1.0 ml/L + Carbendazim @ 2.0 g/L,T61st spray Fipronil @ 1.0 ml/L + Carbendazim @ 2.0 g/L,2nd spray of water@ 500 L/ha ,3rd spray Fipronil @ 1.0 ml/L + Carbendazim @ 2.0 g/L, 4th spray water @500L/ha,5th spray Fipronil @ 1.0 ml/L + Carbendazim @ 2.0 g/L and T7 Control. All other agronomical practices were performed uniformly in all the treatments. The crop was harvested after attaining maturity. The data from two consecutive years were combined and analysed statistically.

Result (2022-23)

Thrips population

Data presented in Table 1. The result showed that the thrips appearance was recorded at 37 days after transplanting, and the overall average thrips population ranged from 0.47 to 0.97 nymphs/plant among the treatments.

The thrips population crossed the Economic threshold levelat 51 DAT in different treatments. The thrips population ranged from 11.37 to 13.43 nymphs /plant was recorded. The data further revealed that the thrips population crossed ETL at 58 DAT, 65 DAT, 72 DAT, 86 DAT and 93 DAT. The overall average lowest thrips population was recorded (8.01 nymphs/plant) in treatment T2(1st spray Fipronil @ 1.0 ml/L + Carbendazim @ 2.0 g/L, 2nd sprayImidacloprid @ 0.5 ml/L + Copper oxychloride @ 3.0 g/L, 3rd spraySpinosad @ 0.3 ml/L + Copper oxychloride @ 3.0 g/L,4th spray Lambdacyhalothrin @ 1.0 ml/L + Carbendazim @ 2.0 g/L,5th spray Profenophos @ 2.0 ml/L + Carbendazim @ 2.0 g/L). The highest thrips population, 43.60 nymphs /plant, were recorded in the control treatment.

Gross and marketable yield

The highest gross and marketable yield (321.70 q/ha and 312.0q/ha) was recorded in treatment T2 while gross yield was found at par with treatment T3 and T5, however lowest gross and marketable yield (266.99q/ha and 247.24q/ha) was recorded in the same plot.

Result (2023-24)

Thrips population

Data presented in Table -2 revealed that the thrips appearance was recorded at 40 days after transplanting, and the overall average thrips population ranged from (0.13-0.53 nymphs/plant) among the treatments. The thrips population crossed the ETL at 68 DAT and ranged from (17.37-20.73 nymphs/plant) in different treatments, and the data did not differ significantly.The data further revealed that the thrips population again crossed the ETL at 75 DAT, 82 DAT and 89 DAT.The significantly lowest thrips population (15.87, 8.39, 7.33 and 4.77 nymphs/plant) were recorded in treatment T_2(1stspray-Imidacloprid @ 0.5 ml/L + Copper oxychloride @ 3 g/L, 2nd spray-Lambda cyhalothrin @ 1 ml/L + Carbendazim @ 2 g/L, 3rd spray-Fipronil @ 1 ml/L + Carbendazim @ 2 g/L)and was found at par with all the treatments except control at 75 DAT, 89 DAT and 96 DAT, however at par with T1, T3 and T4 at 82 DAT, respectively. Significantly overall lowest thrips population, (6.61 nymphs/plant), was recorded in the same treatment$T_{2.}$The highest overall average thrips population (48.62 nymphs/plant) was recorded in T_7 (Control plot).

Gross and marketable yield

The significantly highest gross and marketable yield (351.58 q/ha and 345.71 q/ha) were also recorded in treatment $T_{2,}$ and gross yield was found at par with T_1, T_3 and T_5treatments.

Result of combined data during 2022-23 and 2023-24

Thrips population

The combined data presented in Table 3 revealed that the thrips appearance was recorded at 40 days after transplanting, and the average thrips population ranged from 0.40 to 0.62 nymphs/plant among the treatments. The thrips population crossed the ETL at 68 DAT and ranged from (12.73-26.07 nymphs/plant) in different treatments, and the significantly lowest number of thrips (12.73 nymphs/plant) was recorded in $T_{2,}$ which was found at par with T_1, T_5 and T_6. The data further revealed that the thrips population again crossed the ETL at 75 DAT, 82 DAT and 89 DAT.The significantly lowest thrips population (8.30, 7.83 and 5.52 nymphs/plant) were recorded in treatment T_2 at 82 DAT, 89 DAT and 96 DAT, which was found at par with T_1, T_4 and T_5 at 82 DAT, T_1, T_3, T_5 and T_6 at 89 DAT, while at par with all the treatments except control at 96 DAT.

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Significantly overall lowest thrips population, (7.31 nymphs/plant), was recorded in the same treatment T_2. The highest overall average thrips population (46.11 nymphs/plant) was recorded in T_7 (Control plot).

Gross and marketable yield

The significantly highest gross and marketable yield (336.64 q/ha and 328.85 q/ha) were also recorded in treatment T_2, which was found at par with T_1, $T_3$and T_5.The highest (ICBR1:6.69) was also recorded in the same treatment (T_2).

Discussion

The present study conforms to the results obtained by different researchers, Patel *et al*. (2001) and Noor (2001) [16] [15] who found Profenophos may be effective against many sap-feeding insects such as onion thrips and Chilli thrips. Similarly, Lazano and Kilchher (1998) [11] reported that Spinosad may also be used for controlling thrips under field conditions.Pandey *et al*. (2013) [21] recorded that the lowest thrips population and the highest bulb yield were recorded by applying fipronil. The other workers also reported that fipronil and imidacloprid reduced the thrips damage severity and increased the onion bulb yield (Ullah *et al.*2010) [29]. Similarly, Pathak *et.al.* (2018),(2021)[20] [19] reported that the lowest thrips population and highest onion seed yield was recorded with application of fipronil insecticides@1.0ml/L + silica-based surfactant@0.5ml/L at 15-day intervals which was effective for control of onion thrips and increased the onion yield and quality of onion. Tirkey *and* Kumar(2017), Kurbett*et. al*. (2015) [28] [8] reported that thiamethoxam was proven to be the most effective for thrips control. Asgar *et. al.* (2018) [1] suggested that the insecticides reduced the thrips population compared to the control, and the highest yield was obtained by the use of Dimethoate. Kumar and Singh (2011), Das *et.al.* (2017) [9] [3] reported that the spray of Imidaclorprid given at a 15-day interval recorded the lowest thrips population and gave the highest gross yield.Mohammad*et. al.*(2021)[14]recorded that Acetameprid SL, chlorpyrifos SL and carbaryl WP were significantly higher compared to Emamectin benzoate EC, lambda-cyhalothrin EC and cypermethrin EC, respectively.Kiros Asgele and YohansGebremikel(2025) [7]suggested that the Lamdacyhalothrin was better for controlling thrips population as well as increasing the yield. Tedle Shibru (2022)[27] Based on these results, it was recommended that Profenofos 720 EC alone and the mixture of other chemical insecticides (Deltamethrin and Emamectin benzoate) be effective for the management of onion thrips under field conditions. The study revealed that the mentioned insecticides were highly effective inminimising onion thrips population as well as increasing onion yield.

Table 1: Effect of different insecticides against thrips in onion 2022-23

Treatments	Thripspopulation(Nymphs/plant)								
	37DAT	44DAT	51DAT	58DAT	65DAT	72DAT	79DAT	86DAT	93DAT
T1	0.97	2.17	13.07	4.80	8.70	19.17	10.77	11.03	8.07
T2	0.83	3.00	12.67	5.67	8.10	19.03	8.20	8.33	6.27
T3	0.90	2.90	12.93	3.33	7.37	16.23	11.93	12.33	9.67
T4	0.73	1.83	12.47	4.87	8.67	20.67	8.73	17.60	8.67
T5	0.70	2.57	12.63	4.00	7.43	20.93	8.07	12.40	8.97
T6	0.47	2.73	11.37	3.77	7.63	22.13	28.13	14.97	9.17
T7	0.60	3.17	13.43	22.60	31.40	45.50	64.83	88.17	122.70
S.Em±	**0.19**	**0.33**	**0.89**	**0.55**	**0.62**	**1.25**	**1.61**	**2.46**	**2.64**
CD@ 5%	**NS**	**0.72**	**NS**	**1.20**	**1.35**	**2.72**	**3.51**	**5.36**	**5.75**
CV%	**31.18**	**15.61**	**8.66**	**9.70**	**6.74**	**6.55**	**9.79**	**12.80**	**13.05**

Treatments	Overallaveragethripspopulation	Grossyield (q/ha)	Marketableyield(q/ha)
T1	8.75	312.42	305.84
T2	8.01	321.70	312.00
T3	8.62	314.21	301.83
T4	9.36	303.14	285.69
T5	8.63	314.73	302.20
T6	11.15	301.16	291.04
T7	43.60	266.99	247.24
S.Em±	**0.51**	**4.64**	**5.42**
CD@ 5%	**1.11**	**10.11**	**11.81**
CV%	**4.44**	**1.86**	**2.27**

Table 2: Effect of different insecticides against thrips in onion 2023-24

Treatments	Thrips population (Nymphs/plant)								
	40 DAT	47 DAT	54 DAT	61 DAT	68 DAT	75 DAT	82 DAT	89 DAT	96 DAT
T1	0.27	0.00	1.13	5.73	17.97	16.43	8.57	8.40	5.43
T2	0.13	0.00	0.83	4.82	17.37	15.87	8.39	7.33	4.77
T3	0.33	0.00	1.17	5.53	19.83	16.23	9.10	7.97	4.87
T4	0.37	0.00	1.33	5.87	18.77	17.07	9.50	8.83	5.03
T5	0.43	0.00	1.37	5.07	19.33	16.47	10.20	7.70	5.77
T6	0.33	0.00	1.23	5.60	19.23	16.33	17.87	7.63	5.70
T7	0.53	0.00	1.23	6.33	20.73	87.07	99.07	103.37	119.27
S.Em±	**0.17**	-	**0.13**	**0.45**	**1.08**	**2.09**	**0.63**	**1.35**	**1.09**
CD @ 5%	**NS**	-	**0.28**	**NS**	**NS**	**4.55**	**1.37**	**2.94**	**2.37**
CV %	**61.93**	-	**13.04**	**10.01**	**6.96**	**9.68**	**3.31**	**7.65**	**6.22**

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Treatments	Overall average thrips population	Gross yield (q/ha)	Marketable yield (q/ha)
T1	7.10	346.76	334.50
T2	6.61	351.58	345.71
T3	7.23	344.94	332.26
T4	7.42	326.92	315.85
T5	7.37	346.32	334.92
T6	8.21	312.92	306.34
T7	48.62	265.70	238.34
S.Em±	**0.22**	**3.58**	**3.16**
CD @ 5%	**0.48**	**7.80**	**6.89**
CV %	**2.06**	**1.34**	**1.23**

Table 3: Effect of different insecticides against thrips in onion (Combined data 2022-23& 2023-24)

Treatments	Thrips population (Nymphs/plant)								
	40 DAT-I	47 DAT-II	54 DAT-III	61 DAT-IV	68 DAT-V	75 DAT-VI	82 DAT-VII	89 DAT-VIII	96 DAT-IX
T1	0.62	1.08	7.10	5.27	13.33	17.80	9.67	9.72	6.75
T2	0.48	1.50	6.75	5.24	12.73	17.45	8.30	7.83	5.52
T3	0.62	1.45	7.05	4.43	13.60	16.23	10.52	10.15	7.27
T4	0.55	0.92	6.90	5.37	13.72	18.87	9.12	13.22	6.85
T5	0.57	1.28	7.00	4.53	13.38	18.70	9.13	10.05	7.37
T6	0.40	1.37	6.30	4.68	13.43	19.23	23.00	11.30	7.43
T7	0.57	1.58	7.33	14.47	26.07	66.28	81.95	95.77	120.98
S.Em±	**0.02**	**0.03**	**0.20**	**0.13**	**0.39**	**1.49**	**0.74**	**1.97**	**2.04**
CD @ 5%	**0.03**	**0.06**	**0.42**	**0.27**	**0.80**	**3.07**	**1.53**	**4.06**	**4.22**

Treatments	Overall average thrips population	Gross yield (q/ha)	Marketable yield (q/ha)	ICBR
T1	7.93	329.59	320.17	1:5.93
T2	7.31	336.64	328.85	1:6.69
T3	7.93	329.58	317.05	1:5.95
T4	8.39	315.03	300.77	1:4.47
T5	8.00	330.53	318.56	1:5.62
T6	9.68	307.04	298.69	1:6.20
T7	46.11	266.34	242.79	-
S.Em±	**0.08**	**8.58**	**9.84**	-
CD @ 5%	**0.16**	**17.71**	**20.31**	-

Conclusion

The study concluded that applying four sequential sprays first with Imidacloprid (0.5 ml/L) + Copper Oxychloride (3.0 g/L), second with Lambdacyhalothrin (1.0 ml/L) + Carbendazim (2.0 g/L), third with Fipronil (1.0 ml/L) + Carbendazim (2.0 g/L), and fourth with Profenophos (2.0 ml/L) + Carbendazim (2.0 g/L) is effective in controlling thrips population and maximizing both gross and marketable yields.

Farmers are suggested to use pesticides for control of thrips population after ETL (7.0 thrips /plant) and on as per-need basis.

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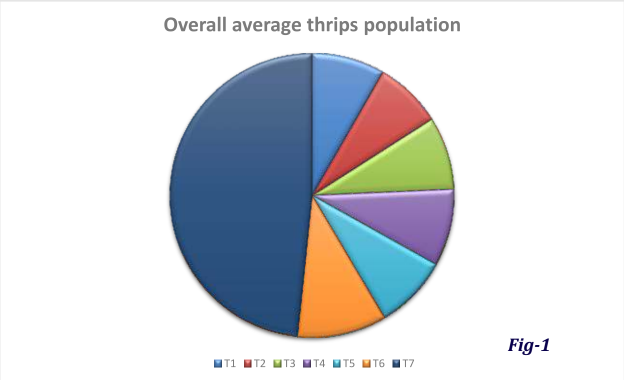

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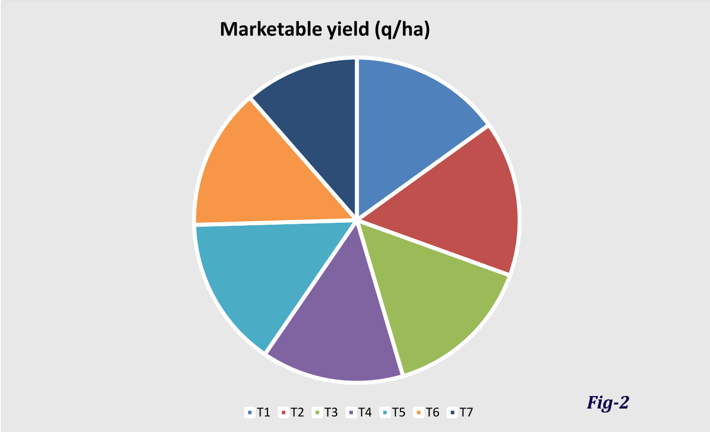

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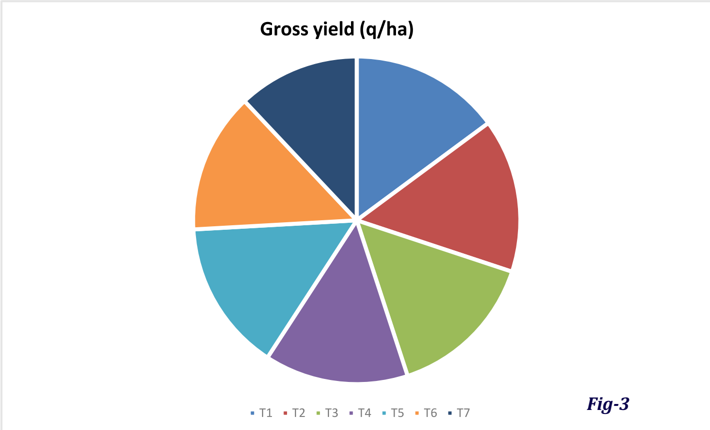

Fig-3

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