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Weed Control Efficiency as Affected by Soil Texture on Wheat Productivity and its Associated Weeds

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Abstract: Two field trail were carried out during two successive growing seasons of 2019/2020 and 2020/2021 at three different locations, to study the effect of some herbicides at different rates in different soil types (clay in Mallawy, sandy in Ismailia and calcareous, sandy loam in Nubaria) on growth character, yield and yield components of wheat and its associated weeds. The experiments were laid out in a randomized complete blocks design (RCBD) with four replications. The results indicated that all weed control treatments reduced fresh weight of total weeds. In clay soil when applied the herbicides [pyroxsulam, 160 cm^3, (mesosulfuron-methyl 1% + iodosulfuron-methyl-sodium 0.2%, 400 cm^3) and (clodinafop-propargyl 3% + pinoxaden 3% + florsulam 0.75%, 500 cm^3/fed)] recorded the highest reduction of weeds and recorded the highest values of the crop growth rate (CGR) and the relative growth rate (RGR) as well as, produced higher grain yield, and its yield components, compared to the herbicides at lower rates and hand weeding treatment. On the other side, when used the previous herbicides in both soil types (sandy and calcareous, sandy loam), recorded the highest reduction of weeds but it not safe on wheat crop, which caused the highest injury on the CGR and RGR rates at two intervals time (30-45 and 45-60 DAS) and its reflects gradually reduction on other self-characters. The previous herbicides at reduced rate 25% recorded satisfactory weed control efficacy of total weeds and they were safer on vegetative growth, as well as, gave better grain yield, and its components in both soil types (sandy and calcareous, sandy loam soil) compared to the same herbicides at reduced rate 50% treatments. The previous results, showed that, in both soils (calcareous, sandy loam and sandy), it is possible used to herbicides [pyroxsulam, (mesosulfuron-methyl 1% + iodosulfuron-methyl-sodium 0.2%) and (clodinafop-propargyl 3% + pinoxaden 3% + florsulam 0.75%)] reduced rate 25% to avoid toxicity and injury, and it is safe for wheat crop plants, in addition to that it gives satisfactory efficiency for controlling weeds.

Key words: Wheat · *Triticum aestivum* L. · Growth character · Weed control · Post-emergence herbicides · Soil types

INTRODUCTION

Wheat (*Triticum aestivum* L.) is the most important cereal crop Kizilgeci *et al*. [1] in the world, as well as in Egypt since it is the stable food for humans Morsy *et al*. [2]. The total consumption of wheat is about 18 million tons, while the total wheat production is about 10 million tons [3]. Therefore, there is a gap between the consumption and the local wheat production about 60% and varies from year to year, which means that Egypt still imports about 10 to 12 million tons annually. So, it is extremely important to search for the best cultural practices to increase wheat production, such as sowing methods, fertilization, weed control…etc.

Weeds competition limit wheat yield potential in arid regions because they increase evapotranspiration and compete with wheat plants for limited soil moisture, water and light resulting in grain yield reduction amounted to 7%, 52% and 92%, respectively and in serious cases may lead to complete crop failure Singh *et al*. [4, 5]. The effect of weeds on wheat yield has been reported by researchers worldwide. Gharde *et al.* [6] reported a 19% wheat yield loss and sometimes complete failure of the crop. There are many weed species compete with wheat. Poor weed management practices, causing ~66% yield reduction in wheat depending upon the weed densities, type of weed flora and its infestation duration [7].

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Therefore, weed control is one of the essential cultural practices for raising wheat yield and improving its quality. Herbicides helped farmers to increase yield while reducing labour. Such as, Pyroxsulam post-emergence herbicide is controlled winter annual grassy weeds, more effectively when applied at the one or three-leaf stage than when applied at the five-leaf stage. Florasulam, is registered for weed control in wheat which it is providing good broadleaf weed control efficacy, but have little to no activity on grassy weeds Pacanoski and Mehmeti [8]. Clodinafop-propargyl is post-emergence herbicide that is used for the selective control of grassy weeds in wheat fields [9]. Soltani and Saeedipour [10] found that the application of (Mesosulfuron-methyl plus Iodosulfuron-methyl) decreased weed dry matter by 86.2%. The excellent control of complex weed flora in wheat was observed with the mix application of clodinafop+metsulfuron and mesosulfuron-methyl+ idosulfuron-methyl sodium [11].

Herbicide activity like as post-emergence herbicides is influenced by many environmental factors such as soil characteristics (organic matter content, biological activity, temperature, clay content and structure and soil pH), precipitation and plant growth have an important impact on herbicide performance [12]. Also, Yamaji *et al.* [13] indicated that environmental factors such as soil properties, rainfall, and field preparation affect performance of post-emergence herbicides.

Therefore, the main objective of this study to determine the efficacy of three herbicides at different rates in different soil types on wheat phytotoxicity and selective suitable herbicide rates for common soil type of Egypt.

MATERIALS AND METHODS

A field trail was carried out during two successive growing winter seasons of 2019/2020 and 2020/2021 at three different locations as different types of soil, to study the effect of herbicides at different rates on growth characters, yield and its components of wheat crop and its associated weeds.

Experimental Soil Analysis: The mechanical and chemical soil analyses for the experimental at three locations Mallawy Agricultural Research Station, Minia Government (clay soil), Ismailia Agricultural Research Station, Ismailia Government (sand soil) and Nubaria Agricultural Research Station, Behera Government (calcareous, sandy loam soil).

Soil analysis was conducted on samples was drawn randomly from 0 – 15 cm depth using a tube auger from 6-7 spots in each plot. Soil samples were collected approximately 50 g from each plot in three locations. The three types of soil in the experimental field are presented in Table (1) according to Jackson [14].

Herbicides application: The experiment in the three locations including the following treatments:

T1. Pyroxsulam (Pallas 4.5% OD) applied at rate 160 cm^3/feddan (feddan= 4200m^2) (7.2 g a.i./fed), post-emergence at 3- 5 leaf stage of wheat.
T2. Pyroxsulam at rate 120 cm^3/fed (5.4 g a.i./fed).
T3. Pyroxsulam at rate 80 cm^3/fed (3.6 g a.i./fed).
T4. Mesosulfuron-methyl 1% + Iodosulfuron-methyl-sodium 0.2% (Atlantis 1.2% OD) applied at rate 400

Table 1: Mechanical and chemical analysis of experimental soil during the 2019/2020 and 2020/2021 seasons.

	Ismailia Agric. Res. Station		Nubaria Agric. Res. Station		Mallawy Agric. Res. Station	
Characters	Season 2019/20	Season 2020/21	Season 2019/20	Season 2020/21	Season 2019/20	Season 2020/21
Mechanical analysis						
Coarse sand %	69.40	66.20	30.00	28.70	8.70	8.80
Fine sand %	25.30	28.00	35.30	36.10	18.40	18.60
Silt %	3.80	3.90	15.10	16.70	37.30	37.20
Clay %	1.50	1.90	19.60	18.50	35.60	35.40
Soil texture	Sandy		Calcareous sandy loam soil		Clay loam	
Chemical analysis						
$CaCO_3$ content %	1.39	1.54	23.00	25.00	9.10	10.20
Organic matter%	0.21	0.25	0.58	0.61	1.50	1.60
pH	7.80	7.90	8.60	8.10	7.73	7.81
EC dm/m(1:5 ext.)	0.35	0.38	1.86	1.25	1.40	1.30

Table 2: Trade, common (Active ingredient) and chemical names, family group and site of action of the herbicides.

Trade name	Active ingredient	Chemical name	Family group	Site of Action	WSSA Group
Pallas 4.5% OD	Pyroxsulam	N-(5,7-dimethoxy[1,2,4]triazolo[1,5-a]pyrimidin-2-yl)-2 -methoxy-4-(trifluoromethyl)-3-pyridinesulfonamide	Triazolopyrimidine	Inhi. of)ALS/ AHAS) synth.	(2)
	Mesosulfuron-methyl 1% +	methyl 2-[[[[(4,6-dimethoxy-2-pyrimidinyl)amino]carbonyl] amino]sulfonyl]-4-[[(methylsulfonyl)amino]methyl]benzoate			(2)+
Atlantis 1.2% OD	Iodosulfuron-methyl -sodium 0.2%	methyl 4-iodo-2-[[[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl) amino]carbonyl]amino]sulfonyl]benzoate, sodium salt	Sulfonylurea	Inhi. of)ALS/ AHAS) synth.	(2)
	Clodinafop-propargyl 3% +	propynyl (R)-2-[4-[(5-chloro-3-fluoro-2-pyridinyl) oxy]phenoxy]propanoate other names piroxofop-propinyl	Aryloxyphenoxy propionate	Inhi. of (ACCase) enzyme +	(1)+
Traxos-one 6.75% EC	Pinoxaden 3% +	8-(2,6-diethyl-4-methylphenyl)-1,2,4,5-tetrahydro-7-oxo-7H-pyrazolo[1,2-d][1,4,5]oxadiazepin-9-yl 2,2-dimethylpropanoate	+Phenylpyrazoline	Inhi. of (ACCase) enzyme fatty acid synthesis	(1)+
	Florasulam 0.75%	N-(2,6-difluorophenyl)-8-fluoro-5-methoxy [1,2,4]triazolo[1,5-c]pyrimidine-2-sulfonamide	+ Triazolopyrimidine	+ Inhi. of (ALS/ AHAS) synth.	(2)*

Inhi.= Inhibition

cm^3/fed (4.8 g a.i./fed), post-emergence applied at 3-5 leaf stage of wheat.

T5. Mesosulfuron-methyl 1% + Iodosulfuron -methyl-sodium 0.2% at rate 300 cm^3/fed (3.6 g a.i./fed).

T6. Mesosulfuron-methyl 1% + Iodosulfuron-methyl-sodium 0.2% at rate 200 cm^3/fed (2.4 g a.i./fed).

T7. Clodinafop-propargyl 3% + Pinoxaden 3% + Florasulam 0.75% (Traxos- one 6.75% EC) applied at rate 500 cm^3/fed (33.75 g a.i./fed), post-emergence applied at 3- 5 leaf stage of wheat.

T8. Clodinafop-propargyl 3% + Pinoxaden 3% + Florasulam 0.75% at rate 375 cm^3/fed (25.31 g a.i./fed).

T9. Clodinafop-propargyl 3% + Pinoxaden 3% + Florasulam 0.75% at rate 250 cm^3/fed (16.88 g a.i./fed).

T10. Hand weeding twice at 30 and 45 days after sowing (DAS).

T11. Unweeded check (Control).

All herbicides treatments were sprayed by Knapsack sprayer CP_3 in water volume 200 L/fed. Trade, active ingredient and chemical names, family group and site of action of the herbicides according to pesticides manual [15] and number of group according to (WSSA) classification used in this study are shown in Table 2.

The experiment in each location was arranged in a Randomized Complete Blocks Design with four replicates in both seasons. The plot area was 10.5 m^2 (3.5 m length and 3.0 m width). Each plot included 15 rows. *Triticum aestivum* cultivar Giza 171 was (70 kg/fad) sown by Afir Drill sowing methods on 22nd and 26th of November in Nubaria Agric. Res. Station and Mallawy Agric. Res. Station), while, in Ismailia Agric. Res. Station on 22nd and 25th in November in the first and second season, respectively. The preceding crop was maize (*Zea mays* L.) in both location (Nubaria Agric. Res. Station and Mallawy Agric. Res. Station) but in Ismailia Agric. Res. Station was peanut (*Arachis hypogaea* L.) in both seasons. All Agricultural practice (i.e. fertilizer, irrigation, and pest and diseases control) was carried out according to the local recommendations. Harvest was at the second week of May in both seasons.

Recorded Data:

1-On weed: The dominated weed species counted in the experimental plots in both seasons were shown in Table 3.

Weeds were hand pulled from one square meter at random from each plot after 65 days from sowing. The fresh weights of annual broad-leaved, grassy and total annual weeds were estimated (g/m^2). Weed control % was evaluated in the form of percent reduction (%R) in the fresh weight of each individual groups of weeds as well as the total weeds according to Topps and Wain [16] formula as following:

$$\%R = (A - B)/A \times 100$$

Where: A and B refer to fresh weight of weeds in the unweeded check (control) and treated plots, respectively.

2- On Plant Toxicity Assessment:

a- First: Through Visual Observation: To record herbicides toxicity on wheat plants injury stand and growth visual assessment of crop response is based on

Table 3: The dominated weed species in the experimental plots in both seasons at three locations, Ismailia (sandy soil), Nubaria (calcareous sandy loam soil) and Mallawy (clay soil), Agricultural Research Stations.

Weed types	Ismailia	Nubaria	Malawy
Broad Leaved weeds	*Chenopodium album,* L.	–	–
	Melilotus indica L.	–	–
	Sinapis arvensis L.	*Sinapis arvensis* L.	*Sinapis arvensis* L.
	Emex spinosus L.	*Emex spinosus* L.	–
	Silene rubella L.	–	–
	Anagallis arvensis, L.	*Anagallis arvensis,* L	*Anagallis arvensis,* L
	–	*Cichorium pumilum,* Jacq	–
	–	*Sonchus oleraceus,* L.	–
	–	–	*Euphorbia helioscopia,* L.
	–	–	*Rumex dentatus,* L.
Grassy weeds	*Lolium sp.*	*Lolium sp.*	–
	–	*Phalaris minor Retz*	*Phalaris paradoxa* L.
	–	*Avena spp.*	*Avena spp.*

such effects as plant kill, crop growth and population and also injury to plants etc.., by particular herbicide treatments. Visually evaluated based on a Ratings scale 0-100 percentage with 0 = no effect (crop no injury and normal) and 100% = complete effect (complete destruction of crop or plant death) according to Frans *et al*. [17]. Visual estimates of percent wheat injury were estimated 15 and 30 days after application, based on chlorosis and necrosis for each soil and describing the symptoms.

b- Second: Quantitative assessment by Wheat growth analysis: Plants were taken from 50x50 cm quadrate from each plot at 30, 45 and 60 days after sowing the crop's growth rate **(CGR)** by estimating the increase of plant material per unit of ground area per unit of time at the three intervals were estimated using the following formula;

$$CGR= (W_2-W_1)/ (T_2-T_1) \text{ g/m}^2 \text{/week, [18].}$$

The relative growth rate **(**RGR): the increase of plant material per unit of present per unit at the three intervals was measured as follows:

$$RGR= (\log e\ W_2 - \log e\ W_1)/ (T_2 - T_1) \text{ g/g/week, [18].}$$

Where: W_1 and W_2 respectively refer to dry weight of wheat plants at time (T_1 and T_2) in weeks.

3- On yield and its Components: At harvest, samples of ten plants were taken at random collected from each plot to estimate; plant height (cm), number of spikes/m^2, number of grains/spike and 1000-grain weight (g). The straw yield (ton/fed.) and Grain yield in each plot was taken and calculated (ardab/fed.); (one ardab = 150 kg).

4- Statistical analysis: All data were statistically analyzed according to technique of Analysis of Variance (ANOVA) for the Randomized Complete Block Design with four replicates as described by Gomez and Gomez [19]. Duncan [20] multiple range tests were used for the comparison among means. All statistical analysis was performed using analysis of variance technique by means of MSTAT-C computer.

RESULTS AND DISCUSSION

Effect of Weed Control Treatments on Fresh Weight (gm/m^2) of Annual Weeds: Data in Table (4) revealed that the efficacy of the post-emergence herbicides of [pyroxsulam at 160 cm^3, (mesosulfuron-methyl 1% + iodosulfuron-methyl-sodium 0.2%) at 400 cm^3 and (clodinafop-propargyl 3% + pinoxaden 3% + florasulam 0.75%) at 500 cm^3] at recommended rates were significant higher in controlling of total weeds whereas reached to (93.1, 92.2 and 91.2%), respectively in the sandy soil, similar trend was noticed in calcareous, sandy loam soil where it reached (96.0, 97.4 and 95.4%), respectively, also, in clay soil whereas (97.3, 93.1 and 96.5 %), respectively compared to the herbicides at lower rates and hand weeding, in the first season.

Also, the post-emergence herbicides of [pyroxsulam at 120 cm^3, (mesosulfuron-methyl 1% + iodosulfuron-methyl-sodium 0.2%) at 300 cm^3 and (clodinafop-propargyl 3% + pinoxaden 3% + florasulam 0.75%) at 375 cm^3] at reduced rate 25% were gave satisfactory controlling effect of total weeds whereas reached to (88.0, 87.2 and 87.7%), respectively in the sandy soil, and in calcareous, sandy loam soil whereas reached to (88.9 90.0 and 86.3%), respectively compared in clay soil gave reducing percentage were (70.2, 69.5 and 68.3 %),

Table 4: Effect of weed control treatments on fresh weight of total annual weeds g/m^2 after 60 days from sowing in different type soils during 2019/2020 and 2020/2021 seasons.

		Fresh weight of total annual weeds g/m^2					
		Sandy		Calcium		Clay	
Treatment		Mean	Cont.%	Mean	Cont.%	Mean	Cont.%
		2019/2020					
1	Pyrox. 160 cm^3	143.0 f	93.1	101.0 f	96.0	66.7 f	97.3
2	Pyrox. 120 cm^3	249.3 de	88.0	283.0 e	88.9	731.7 d	70.2
3	Pyrox. 80 cm^3	716.0 b	65.4	986.0 bc	61.3	1378.0 c	43.8
4	Mesos. + Iodo. 400 cm^3	162.0 f	92.2	66.3 f	97.4	169.0 f	93.1
5	Meso. + Iodo. 300 cm^3	266.0 d	87.2	253.7 e	90.0	748.0 d	69.5
6	Meso. + Iodo. 200 cm^3	766.0 b	63.0	1061.7 b	58.3	1562.3 b	36.3
7	Clodi.+ Pin. + Flor. 500 cm^3	181.7 def	91.2	118.3 f	95.4	85.0 f	96.5
8	Clodi.+ Pin. + Flor 375 cm^3	254.0 de	87.7	350.3 e	86.3	777.7 d	68.3
9	Clodi.+ Pin. + Flor. 250 cm^3	804.7 b	61.1	934.3 c	63.3	1512.0 b	38.4
10	Hand weeding	515.7 c	75.1	534.3 d	79.0	532.0 e	78.3
11	Un-weeded	2071.0 a	0.0	2548.3 a	0.0	2453.3 a	0.0
		2020/2021					
1	Pyrox. 160 cm^3	158.3 h	93.0	77.7 gh	93.8	93.7 f	95.7
2	Pyrox. 120 cm^3	222.7 fg	90.1	153.3 e	87.7	705.0 cd	67.4
3	Pyrox. 80 cm^3	749.3 d	66.8	486.7 c	60.9	1350.0 b	37.5
4	Mesos. + Iodo. 400 cm^3	175.3 h	92.2	48.3 h	96.1	153.7 ef	92.9
5	Meso. + Iodo. 300 cm^3	250.7 f	88.9	110.7 fg	91.1	719.0 cd	66.7
6	Meso. + Iodo. 200 cm^3	917.3 b	59.4	568.3 b	54.4	1552.3 b	28.2
7	Clodi.+ Pin. + Flor. 500 cm^3	201.7 gh	91.1	63.7 gh	94.9	180.0 ef	91.7
8	Clodi.+ Pin. + Flor 375 cm^3	240.7 fg	89.3	133.3 ef	89.3	808.3 c	62.6
9	Clodi.+ Pin. + Flor. 250 cm^3	815.0 c	63.9	465.3 c	62.7	1511.7 b	30.1
10	Hand weeding	519.3 e	77.0	286.7 d	77.0	605.3 d	72.0
11	Un-weeded	2257.3 a	0.0	1246.0 a	0.0	2161.3 a	0.0

pyrox.= pyroxsulam, mesos. + iodo. = mesosulfuron-methyl + iodosulfuron-methyl-sodium, clodi. + pin. + flor. = clodinafop-propargyl + pinoxaden + florasulam. Means followed by the same letters within each column do not differ significantly according to Duncan's Multiple Range test at the 5% level.

respectively ,while, the post emergence of [pyroxsulam at 80 cm^3, (mesosulfuron-methyl 1% + iodosulfuron-methyl-sodium 0.2%) at 200 cm^3 and (clodinafop-propargyl 3% + pinoxaden 3% + florasulam 0.75%) at 250 cm^3] at the reduced rate 50% gave lower effective control on total fresh weeds of the three different location, in the first season. The same trend was observed in the second season. There was no difference in weed control efficacy between the experiments in each different location. This is because the herbicides applications in each site were carried out under same commercial wheat fields. Consequently, the activity of herbicides on the target weed species was similar tested in research study for wheat crop. In this respect, Kostov and Pacanoski [21] revealed that the combinations (florasulam + flumetsulam applied at 50 and 70 ml ha^{-1}) provided 92 and 98%, respectively control of broad-leaved weeds. Effective control of broad-leaved weeds with metsulfuron-methyl in winter wheat was reported by Markovic *et al*. [22] as well. Pyroxsulam is widely used to remove various weeds in wheat fields, such as black grass and wild oats [23]. However, the herbicides Pyroxsulam, Iodosulfuron-methylsodium and Mesosulfuron-methyl selectively control both grass and broad-leaved weeds in wheat. Pyroxsulam is a broad-spectrum herbicide for grasses and broad-leaved weeds control in wheat [24]. Pinoxaden satisfactorily controls (> 92%) on grassy weeds Kieloch *et al*. [25]. Also, the effective control of grass weeds with post-emergence application Pinoxaden 2.53% + Clodinafop-propargyl 2.53% at 50 g/ ha resulted in excellent control when reported earlier [26].

Plant Toxicity Assessment:

a) First: through visual observation: A perusal of visual phytotoxicity scoring in Table (5) revealed that the greatest wheat injury and discoloration were recorded at 15 days after spray the application of the post-emergence herbicides of [pyroxsulam at 160 cm^3, (mesosulfuron-methyl 1% + iodosulfuron-methyl-sodium 0.2%) at 400 cm^3 and (clodinafop-propargyl 3% + pinoxaden 3% + florasulam 0.75%) at 500 cm^3] at recommended rates gave setback to wheat crop by causing more persistent injury to wheat plants putting the plants under doubtful recovery zone and still injury persistent to next stage at

Table 5: Visual phytotoxicity scoring on wheat plants at different growth stages as affecting by weed control treatments in different type's soil in 2019/2020 season.

	Visual rating											
	Leaf necrosis						Yellowing of leaf					
	15 days after spray			30 days after spray			15 days after spray			30 days after spray		
Treatment	Sandy	Calc.	Clay	Sandy	Calc.	Clay	Sandy	Calc.	Clay	Sandy	Calc.	Clay
1 Pyrox. 160 cm^3	90	85	0	90	85	0	90	85	0	95	85	0
2 Pyrox. 120 cm^3	15	20	0	0	0	0	10	10	0	0	0	0
3 Pyrox. 80 cm^3	0	0	0	0	0	0	0	0	0	0	0	0
4 Mesos. + Iodo. 400 cm^3	85	75	0	80	70	0	80	75	0	80	75	0
5 Meso. + Iodo. 300 cm^3	7	5	0	0	0	0	10	10	0	0	0	0
6 Meso. + Iodo. 200 cm^3	0	0	0	0	0	0	0	0	0	0	0	0
7 Clodi.+ Pin. + Flor. 500 cm^3	90	80	0	80	78	0	88	80	0	80	70	0
8 Clodi.+ Pin. + Flor 375 cm^3	15	17	0	0	0	0	13	11	0	0	0	0
9 Clodi.+ Pin. + Flor. 250 cm^3	0	0	0	0	0	0	0	0	0	0	0	0
10 Hand Weeding	0	0	0	0	0	0	0	0	0	0	0	0
11 Un-weeded	0	0	0	0	0	0	0	0	0	0	0	0

pyrox.= pyroxsulam, mesos. + iodo. = mesosulfuron-methyl + iodosulfuron-methyl-sodium, clodi. + pin. + flor. = clodinafop-propargyl + pinoxaden + florasulam. Means followed by the same letters within each column do not differ significantly according to Duncan's Multiple Range test at the 5% level.

Table 6: Effect of weed control treatments on the crop's growth rate (CGR) in wheat in different type soils in 2019/2020 and 2020/2021 seasons.

	CGR (g m^{-2} $week^{-1}$)											
	2019/2020						2020/2021					
	Sandy		Calc.		Clay		Sandy		Calc.		Clay	
Treatment	(30-45 DAS)	(45-60 DAS)	(30-45 DAS)	(45-60 DAS)	(30-45 DAS)	(45-60 DAS)	(30-45 DAS)	(45-60 DAS)	(30-45 DAS)	(45-60 DAS)	30-45 DAS)	(45-60 DAS)
Pyrox. 160 cm^3	26.4 e	51.0 d	17.5 c	32.1c	84.8 ab	176.2 a	17.4 c	52.4 e	15.1 b	28.5 c	86.0 a	175.0 a
Pyrox. 120 cm^3	80.0 abc	172.8 ab	83.1 ab	174.0 ab	82.0 abcd	160.7 b	84.5 a	162.6 bcd	85.2 a	181.1 ab	81.6 ab	157.7 b
Pyrox. 80 cm^3	74.8 bcd	165.6 bc	81.1 ab	171.9 b	76.0 de	140.7 d	73.5 b	155.7 d	86.4 a	180.7 ab	72.8 bcd	146.0 bc
Mesos. + Iodo. 400 cm^3	25.2 e	48.2 d	20.5 c	43.4 c	83.8 abc	175.8 a	18.6 c	43.9 f	19.2 b	32.8 c	85.1 a	174.8 a
Meso. + Iodo. 300 cm^3	81.7 ab	169.7 abc	82.9 ab	176.6 ab	79.3 bcde	152.3 bc	83.2 a	164.8 bc	87.0 a	182.9 ab	75.3 abc	159.7 b
Meso. + Iodo. 200 cm^3	71.3 cd	162.4 c	78.2 b	170.4 b	78.5 bcde	142.0 d	74.3 b	159.0 cd	84.4 a	181.5 ab	70.0 cd	139.7 c
Clodi.+ Pin. + Flor. 500 cm^3	27.5 e	40.5 e	15.6 c	47.5 c	84.5 abc	175.7 a	18.9 c	48.7 ef	17.8 b	31.8 c	82.0 ab	174.0 a
Clodi.+ Pin. + Flor 375 cm^3	79.4 abcd	170.1 a	80.0 ab	172.9 b	81.7 abcd	156.7 b	83.0 a	168.1 ab	88.7 a	181.7 ab	79.5 abc	156.0 b
Clodi.+ Pin. + Flor. 250 cm^3	70.9 d	164.9 bc	77.9 b	173.5 ab	77.0 cde	143.7 cd	73.2 b	158.6 cd	87.1 a	179.2 ab	70.8 cd	147.0 bc
Hand weeding	87.6 a	177.4 a	88.6 a	181.4 a	88.5 a	178.5 a	88.2 a	174.7 a	89.9 a	188.2 a	86.2 a	175.7 a
Un-weeded	83.3 ab	161.8c	82.9 ab	170.5 b	74.0 e	112.8 e	82.8 a	156.4cd	87.8 a	178.6 b	63.5d	121. d

pyrox.= pyroxsulam, mesos. + iodo. = mesosulfuron-methyl + iodosulfuron-methyl-sodium, clodi. + pin. + flor. = clodinafop-propargyl + pinoxaden + florasulam. Means followed by the same letters within each column do not differ significantly according to Duncan's Multiple Range test at the 5% level.

30 days after spray in both sandy and calcareous, sandy loam soils comparing than clay soil and hand weeding treatment. In addition, the post-emergence herbicides [pyroxsulam at 120 cm^3, (mesosulfuron-methyl 1% + iodosulfuron-methyl-sodium 0.2%) at 300 cm^3 and (clodinafop-propargyl 3% + pinoxaden 3% + florasulam 0.75%) at 375 cm^3] at reduced rate 25% at 15 days after spray caused slight injury of wheat plants but not persistent injury at this stage and onwards day at 30 days after spray. As well as, it is causing moderate degree of leaf yellowing and this stag was recovered/regrowth of wheat plants in the sandy and the calcareous, sandy loam soils in the next stage at 30 days after spray compared clay soil. While, the post emergence herbicides [pyroxsulam at 80 cm^3, (mesosulfuron-methyl 1% + iodosulfuron-methyl-sodium 0.2%) at 200 cm^3 and (clodinafop-propargyl 3% + pinoxaden 3% + florasulam 0.75%) at 250 cm^3] at the reduced rate 50% not appeared any injury or damaged at this stage and onwards day (Table 5).

b) Second: Quantitative Assessment by Wheat Growth Analysis:

a- Effect of herbicides on the crop's growth rate (CGR): Results in Table (6) at (30-45 DAS) revealed that the post-emergence herbicides of [pyroxsulam at 160 cm^3, (mesosulfuron-methyl 1% + iodosulfuron-methyl-sodium 0.2%) at 400 cm^3 and (clodinafop-propargyl 3% +

Table 7: Effect of weed control treatments on relative growth rate RGR in wheat in different type soils in 2019/2020 and 2020/2021 seasons.

	RGR (g g^{-1} week^{-1})											
	2019/2020						2020/2021					
	Sandy		Calc.		Clay		Sandy		Calc.		Clay	
Treatment	(30-45 DAS)	(45-60 DAS)	(30-45 DAS)	(45-60 DAS)	(30-45 DAS)	(45-60 DAS)	(30-45 DAS)	(45-60 DAS)	(30-45 DAS)	(45-60 DAS)	30-45 DAS)	(45-60 DAS)
Pyrox. 160 cm^3	0.0149 e	0.0044 f	0.0136 e	0.0046 e	0.0354 ab	0.0173 ab	0.0144 d	0.0052 d	0.0139 f	0.0050 c	0.0365 ab	0.0167 a
Pyrox. 120 cm^3	0.0344 bc	0.0180 abc	0.0335 bc	0.0171 ab	0.0330 abc	0.0137 c	0.0333 ab	0.0174 a	0.0345 b	0.0170 a	0.0341 bc	0.0128 b
Pyrox. 80 cm^3 Mesos.	0.0331 bc	0.0139 e	0.0315 c	0.0146 c	0.0304 c	0.0108 d	0.0305 bc	0.0148 b	0.0322 cd	0.0142 b	0.0337 bc	0.0076 c
+ Iodo. 400 cm^3 Meso.	0.0155 e	0.0071 f	0.0149 e	0.0056 e	0.0357 ab	0.0170 b	0.0152 d	0.0061 d	0.0142 f	0.0063 c	0.0370 ab	0.0172 a
+ Iodo. 300 cm^3 Meso.	0.0352 b	0.0182 abc	0.0351 b	0.0172 ab	0.0339 abc	0.0143 c	0.0354 ab	0.0177 a	0.0358 b	0.0174 a	0.0344 bc	0.0133 b
+ Iodo. 200 cm^3	0.0329 bc	0.0146 de	0.0317 c	0.0153 c	0.0300 c	0.0102 d	0.0321 bc	0.0148 b	0.0317 cd	0.0139 b	0.0329 cd	0.0083 c
Clodi.+	0.0145 e	0.0074 f	0.0142 e	0.0053 e	0.0353 ab	0.0167 b	0.0140 d	0.0058 d	0.0138 f	0.0060 c	0.0368 ab	0.0170 a
Clodi.+	0.0347 bc	0.0178 abc	0.0322 c	0.0166 ab	0.0322 abc	0.0140 b	0.0352 ab	0.0176 a	0.0339 bc	0.0170 a	0.0335 bc	0.0130 b
Clodi.+	0.0316 c	0.0141 de	0.0311 c	0.0149 c	0.0301 c	0.0110 c	0.0319 bc	0.0145 bc	0.0311 d	0.0143 b	0.0328 cd	0.0081 c
Hand weeding	0.0389 a	0.0195 a	0.0385 a	0.0187 a	0.0364 a	0.0181 a	0.0383 a	0.0188 a	0.0381 a	0.0184 a	0.0386 a	0.0179 a
Un-weeded	0.0247 d	0.0142 de	0.0271 d	0.0098 d	0.0313 bc	0.0106 d	0.0271 c	0.0131 c	0.0244 e	0.0128 b	0.0297 d	0.0071 c

pyrox.= pyroxsulam, mesos. + iodo. = mesosulfuron-methyl + iodosulfuron-methyl-sodium, clodi. + pin. + flor. = clodinafop-propargyl + pinoxaden + florasulam. Means followed by the same letters within each column do not differ significantly according to Duncan's Multiple Range test at the 5% level.

pinoxaden 3% + florasulam 0.75%) at 500 cm^3/fed.)] at recommended rates gave significantly the highest injury of the crop growth rate (CGR) on wheat plants, whereas, the decreasing in the previous herbicides were in sandy soil (24.4, 25.2 and 27.5 g m^{-2} week^{-1}), and calcareous, sandy loam soils (17.5, 20.5 and 15.6 g m^{-2} week^{-1}), respectively, compared to hand weeding treatment. Even, at (45-60 DAS) these treatments still gave significantly the lower CGR in the two same previous soils were (51.0, 48.2 and 40.5 g m^{-2} week^{-1} & 32.1, 43.4 and 47.5 g m^{-2} week^{-1}), respectively, in the first season. The same trend was in the second season**.** Otherwise, no adverse effect on wheat plants in the clay soil when used the same previous herbicides treatment were recorded the maximum CGR at 30-45 DAS (84.8, 83.8 and 84.5 g m^{-2} week^{-1}), and at 45-60 DAS (176.2, 175.8 and 175.7 g m^{-2} week^{-1}), respectively in the first season. The same trend was in the second season.

On the contrary, the results in Table (6) showed that the post-emergence herbicides of [pyroxsulam at 120 cm^3, (mesosulfuron-methyl 1% + iodosulfuron-methyl-sodium 0.2%) at 300 cm^3 and (clodinafop-propargyl 3% + pinoxaden 3% + florasulam 0.75%) at 375 cm^3)] at reduced rate 25% no adverse effect on the crop growth rate (CGR) on wheat plants at 30-45 DAS, whereas, gave the highest CGR (80.0, 81.7 and 79.4 g m^{-2} week^{-1}), respectively in sandy soil, also, in calcareous, sandy loam soil recorded (83.1, 82.9 and 80.0 g m^{-2} week^{-1}), respectively, also at (45-60 DAS) gave the similar direction at which was statistically similar to two hand weeding treatment.

At (30-45 DAS) the CGR in the clay soil was non-significantly affected by the previous herbicides treatment and the high rates of herbicides and hand weeding treatments, while, at (45-60 DAS) the previous post-emergence herbicides gave lower CGR (160.7, 152.3 and 156.7 g m^{-2} week^{-1}), respectively than the herbicides treatment high dose and hand-weeding treatments, and [pyroxsulam at 80 cm^3, (mesosulfuron-methyl 1% + iodosulfuron-methyl-sodium 0.2%) at 200 cm^3 and (clodinafop-propargyl 3% + pinoxaden 3% + florasulam 0.75%) at 250 cm^3)] at the reduced rate 50% are statistically at par to each other, and they gave no adverse effect on the crop growth rate (CGR) on wheat plants at the two intervals (30-45 DAS and 45-60 DAS) in the first season. The same trend was in the second season.

b- Effect of Herbicides on the Relative Growth Rate (RGR): Results in Table (7) showed that the change in RGR during the growing season, at (30-45 DAS) the (RGR) was significantly affected by the post-emergence herbicides of [pyroxsulam at 160 cm^3, (mesosulfuron-methyl 1% + iodosulfuron-methyl-sodium 0.2%) at 400 cm^3 and (clodinafop-propargyl 3% + pinoxaden 3% + florasulam 0.75%) at 500 cm^3/fed.] at recommended rates in sandy soil reached to (0.0149, 0.0155 and 0.0145 g g^{-1} week^{-1}), and (0.0136, 0.0149 and 0.0142 g g^{-1} week^{-1}), respectively in calcareous, sandy loam soil, compared to hand weeding treatment in the first season. The resulted had the same trend in the second season. Also, the same

pervious herbicide treatments at (45-60 DAS) gave the same decreasing the RGR in both soils whereas (0.0044, 0.0071 and 0.0074 & 0.0046, 0.0056 and 0.0053 g g^{-1} $week^{-1}$), respectively.

Otherwise, results in Table (7) showed that the post-emergence herbicides of [pyroxsulam at 120 cm^3, (mesosulfuron-methyl 1% + iodosulfuron-methyl-sodium 0.2%) at 300 cm^3 and (clodinafop-propargyl 3% + pinoxaden 3% + florasulam 0.75%) at 375 cm^3] at reduced rate 25% gave the highest RGR on wheat plants at 30-45 DAS, (0.0344, 0.0352 and 0.0347 g g^{-1} $week^{-1}$), respectively in sandy soil, also, in calcareous, sandy loam soil recorded (0.0335, 0.0351 and 0.0322 g g^{-1} $week^{-1}$), respectively, as well, in the next rank the post-emergence herbicides [pyroxsulam at 80 cm^3, (mesosulfuron-methyl 1% + iodosulfuron-methyl-sodium 0.2%) at 200 cm^3 and (clodinafop-propargyl 3% + pinoxaden 3% + florasulam 0.75%) at 250 cm^3] at the reduced rate 50% gave the satisfying RGR in both pervious soil types whereas (0.0331, 0.0329 and 0.0316 & 0.0315, 0.0317 and 0.0311 g g^{-1} $week^{-1}$), respectively.

At (45-60 DAS) the highest RGR (0.0180, 0.0182 and 0.0178 g g^{-1} $week^{-1}$), respectively in sandy soil and (0.0171, 0.0172 and 0.0166 g g^{-1} $week^{-1}$), respectively in calcareous, sandy loam soil attained by the treatments post-emergence herbicides of [pyroxsulam at 120 cm^3, (mesosulfuron-methyl 1% + iodosulfuron-methyl-sodium 0.2%) at 300 cm^3 and (clodinafop-propargyl 3% + pinoxaden 3% + florasulam 0.75%) at 375 cm^3 at reduced rate 25%. While, the treatments [pyroxsulam at 80 cm^3, (mesosulfuron-methyl 1% + iodosulfuron-methyl-sodium 0.2%) at 200 cm^3 and (clodinafop-propargyl 3% + pinoxaden 3% + florasulam 0.75%) at 250 cm^3] at the reduced rate 50% gave the lowest RGR (0.0139, 0.0146, 0.0141 and 0.0146, 0.0153, 0.0149 g g^{-1} $week^{-1}$), respectively in both previous soil types (sandy and calcareous, sandy loam) in the first season.

In contrast, in the clay soil no adverse effect on wheat plants at two intervals time (30-45 and 45-60 DAS) when used the post-emergence herbicides at different rates. At (30-45 DAS) there were no significant differences between each of the previous herbicides and hand weeding treatment in both seasons. At 45-60 DAS when used the post-emergence herbicides of [pyroxsulam at 160 cm^3, (mesosulfuron-methyl 1% + iodosulfuron-methyl-sodium 0.2%) at 400 cm^3 and (clodinafop-propargyl 3% + pinoxaden 3% + florasulam 0.75%) at 500 cm^3/fed.] at recommended rates were significantly recorded the maximum RGR whereas (0.0173, 0.0170 and 0.0167 g g^{-1} $week^{-1}$), respectively compared to the both post emergence herbicides at lower rates, in the first season. The results had the same trend in the second season. Kaur *et al*. [27] Found that this might be due to the rapid tiller emergence of the crop during this period. A growing organ is consumer of photosynthetic and RGR is balanced between sources and sink.

The damage of the post-emergence herbicides of [pyroxsulam at 160 cm^3, (mesosulfuron-methyl 1% + iodosulfuron-methyl-sodium 0.2%) at 400 cm^3 and (clodinafop-propargyl 3% + pinoxaden 3% + florasulam 0.75%) at 500 cm^3 /fed.] at recommended rates in sandy and calcareous, sandy loam soils referred to the following two reasons.

a) First Reason: Wheat plant's are able to take up the herbicide at a rapid rate but are not able to metabolize as fast as they can be absorbed [28]. Consequently, it reflects on the crop's growth rate (CGR) and the relative growth rate (RGR) whereas are important indicators to depends on the efficient performance of the plant or crop Issa [29], so that, wheat plant's can't accumulation dry matter in the first period of wheat plant's life when used the pervious herbicides.

b) Second Reason: The phytotoxicity caused by the activity of these pervious Post-emergence herbicides has high rates is due to affect by soil activity which it affected by soil texture, organic matter content, pH and moisture. Whereas, these Post-emergence herbicides are systemic, it is preferable to have soil moisture content in the soil that allows the movement of phloem sap inside the plant to be actively. so these herbicides are more readily available for plant uptake in coarse-textured both soils (sandy and calcareous, sandy loam soil), low organic matter soils whereas (0.21, 0.25%) in sandy soil and (0.58, 0.61%) in calcareous, sandy loam soil), which is helping to increase the effectiveness of these herbicides and causing toxicity or damage to crop plants [30].

The results in Table (6 and 7) showed that CGR and RGR rate recorded high injury on wheat plants at 30-45 DAS were the reduction percentage in sandy soil (30.1, 28.8, 31.4 and 38.2, 39.8, 37.3 %), and calcareous, sandy loam soils were (17.5, 20.5, 15.6 and 35.3, 38.7, 36.8 %), respectively, as compared to clay soil were gave increasing percentage on CGR and RGR rate (95.9, 94.7, 95.5 and 97.2, 97.8, 96.9 %), respectively in the first season. Also, the damage continues in the next period at 45-60 DAS in both soil types (sandy and calcareous, sandy loam). So that, Herbicide applied at a high dosage may kill all the weeds, but also increases the risk of crop injury. This results harmony with Crooks *et al*. [31] reported 7-19% injury for mesosulfuron combinations with thifensulfuron when applied at rate of 140 L ha^{-1} at stage 3.0. Bailey *et al.* [32] reported 9-24% wheat injury

Table 8: Effect of weed control treatments on plant height (cm) and Number of spikes\m^2 in different type soils in 2019/2020 and 2020/2021 seasons.

	Plant height (cm)						Number of spikes/m^2					
	Sandy		Calc.		Clay		Sandy		Calc.		Clay	
Treatment	2019/2020	2020/2021	2019/2020	2020/2021	2019/2020	2020/2021	2019/2020	2020/2021	2019/2020	2020/2021	2019/2020	2020/2021
Pyrox. 160 cm^3	87.0 e	80.3 f	92.7 e	88.3 e	116.7 a	116.5 a	139.7 e	140.3 fg	138.3 e	136.3 e	430.0 a	431.3 a
Pyrox. 120 cm^3	116.0 a	114.4 ab	114.5 a	115.0 a	108.7 c	110.5 bc	429.3 ab	432.7 a	428.3 ab	433.7 a	335.3 b	331.3 c
Pyrox. 80 cm^3 Mesos. +	107.7 bc	109.3 c	104.0 cd	108.0 c	105.0 de	106.3 de	318.3 c	316.0 cd	315.0 c	288.0 c	258.3 c	242.7 de
Iodo. 400 cm^3 Meso. +	85.9 e	82.7 ef	89.1 f	90.0 e	115.0 ab	117.3 a	143.3 e	144.7 f	146.0 e	141.3 e	434.0 a	442.7 a
Iodo. 300 cm^3 Meso. +	114.9 a	115.7 a	116.0 a	115.7 a	107.7 cd	111.6 bc	433.7 a	434.7 a	435.3 a	436.0 a	343.3 b	341.7 bc
Iodo. 200 cm^3 Clodi.+ Pin. +	112.3 ab	111.9 bc	110.3 b	112.0 ab	105.9 cd	107.5 cd	321.3 c	319.3 c	320.7 c	322.3 b	261.0 c	263.0 d
Flor. 500 cm^3 Clodi.+ Pin. +	82.9 e	83.4 e	90.7 f	89.7 e	116.0 ab	116.1 a	138.0 e	137.7 g	142.7 e	139.0 e	431.0 a	431.7 a
Flor 375 cm^3 Clodi.+ Pin. +	115.6 a	114.7 a	115.4 a	114.7 a	108.8 c	110.8 bc	427.3 ab	432.3 a	432.7 ab	434.7 a	334.0 b	339.0 bc
Flor. 250 cm^3	106.0 c	111.3 bc	106.8 c	104.0 d	103.1 e	102.4 e	317.0 c	313.3 d	316.3 c	323.3 b	252.7 c	254.3 de
Hand weeding	114.4 a	113.7 ab	114.7 a	113.7 a	113.7 b	114.3 ab	424.7 b	427.0 b	421.3 b	420.3 a	423.7 a	355.7 b
Un-weeded	90.6 d	102.5 d	103.3 d	109.7 bc	102.5 e	105.2 e	240.0 d	232.0 e	241.3 d	246.3 d	235.3 e	238.7 e

pyrox.= pyroxsulam, mesos. + iodo. = mesosulfuron-methyl + iodosulfuron-methyl-sodium, clodi. + pin. + flor. = clodinafop-propargyl + pinoxaden + florasulam. Means followed by the same letters within each column do not differ significantly according to Duncan's Multiple Range test at the 5% level.

when mesosulfuron was applied at the two- to three-leaf wheat), (two- to three-tiller wheat stage) and (four- to five-tiller wheat stage). Sosnoskie *et al*. [33] Noted severe wheat injury (up to 40%) when UAN was combined with mesosulfuron application. Hoffer *et al*. [34] reported 1.5% average wheat phytotoxicity after pinoxaden treatment at the recommended rate and pyroxsulam caused 5-10% wheat injury at 514 DAT. Geier *et al*. [35] reported that wheat injury with tritosulfuron +dicamba + pyroxsulam was more serious (29%).

While, when used the herbicides of [pyroxsulam at 80 cm^3, (mesosulfuron-methyl 1% + iodosulfuron-methyl-sodium 0.2%) at 200 cm^3 and (clodinafop-propargyl 3% + pinoxaden 3% + florasulam 0.75%) at 250 cm^3/fed.] at the reduced rate 50% was safer for crops and not appeared any damaged in the two soil types (sandy and calcareous, sandy loam soils) but gave the lowest CGR and RGR, also, in the clay soil gave the lowest CGR and RGR rate the results showed in Table (6 and 7) which that severed weed infestation might hamper the growth and development of wheat plants drastically.

On the contrary, when used the same herbicides by reduced rate 25% [pyroxsulam at 120 cm^3, (mesosulfuron-methyl 1% + iodosulfuron-methyl-sodium 0.2%) at 300 cm^3 and (clodinafop-propargyl 3% + pinoxaden 3% + florasulam 0.75%) at 375 cm^3/fed.] were applied in the two soil types (sandy and calcareous, sandy loam soils), also, at the clay soil when used the same previous herbicides at recommended rates were safer for crops and not appeared any injury in wheat plants, as they gave the best CGR and RGR rates on wheat plants. This is mainly attributed to very little crop-weed competition for different growth factors under these treatments since they recorded lowest population of total weeds (narrow and broad leave weeds species) which provided better opportunity to the crop to utilize nutrients, moisture, light and space in better way for its proper growth and development.

Growth Characters:

Plant Height (cm) and Number of Spikes/m^2: The results in Table (8) revealed that the post-emergence herbicides of [pyroxsulam at 120 cm^3, (mesosulfuron-methyl 1% + iodosulfuron-methyl-sodium 0.2%) at 300 cm^3 and (clodinafop-propargyl 3% + pinoxaden 3% + florasulam 0.75%) at 375 cm^3/fed.] at reduced rate 25% when applied in both soils (sandy and calcareous, sandy loam soil) and the same previous herbicides at recommended rates applied in clay soil gave better weed control efficiency, might attributed to the efficiency on weed elimination and consequently decreased weed competitive ability, also, enhancement of wheat growth by plant height, consequently increased canopy shading of leaf area, so increase the efficiency of photosynthetic lead to increasing grain yield. These results are in the same line with those obtained by Soliman *et al*. [36] who revealed that the favorable effects of control weeds on crop growth may gave more chance to better use the edaphic and aboveground environment resources and consequently stimulated growth of crop plants and minimized weed competition to a great extent. Confirming results in this

Table 9: Effect of weed control treatments on Number of grains/spike and Weight of 1000 grains (g) in different type soils in 2019/2020 and 2020/2021 seasons.

	Number of grains /spike						Weight of 1000 grains (g)					
	Sandy		Calc.		Clay		Sandy		Calc.		Clay	
Treatment	2019/2020	2020/2021	2019/2020	2020/2021	2019/2020	2020/2021	2019/2020	2020/2021	2019/2020	2020/2021	2019/2020	2020/2021
Pyrox. 160 cm^3	25.3 e	23.2 e	22.9 f	24.6 f	64.0 a	64.0 a	31.67 e	32.67 e	30.67 f	33.33 e	53.73 a	54.50 ab
Pyrox. 120 cm^3	61.8 a	60.3 ab	62.6 a	61.9 a	41.2 cd	53.2 b	52.33 ab	53.57 a	51.67 a	52.50 a	45.97 bcd	44.77 cde
Pyrox. 80 cm^3 Mesos. +	43.2 cd	40.2 cd	40.3 cd	42.7 cd	36.7 cd	40.1 c	43.43 cd	44.33 c	46.67 b	44.60 bc	42.60 cd	41.13 e
Iodo. 400 cm^3 Meso. +	28.3 e	27.3 e	29.1 e	28.4 e	59.3 ab	62.6 a	34.00 e	35.37 e	34.33 e	34.57 de	55.07 a	56.77 a
Iodo. 300 cm^3 Meso. +	63.7 a	62.3 a	63.9 a	63.3 a	44.3 c	54.3 b	53.67 a	55.43 a	53.33 a	54.17 a	46.07 bcd	47.20 cd
Iodo. 200 cm^3 Clodi.+ Pin. +	45.6 c	41.6 c	42.1 c	45.3 c	41.1 cd	44.4 c	45.67 cd	46.63 bc	45.67 bc	46.60 bc	41.57 d	42.80 de
Flor. 500 cm^3 Clodi.+ Pin. +	26.3 e	25.6 e	24.8 f	26.5 ef	61.2 ab	59.5 a	32.33 e	33.90 e	32.33 ef	31.67 e	54.50 a	53.53 ab
Flor 375 cm^3 Clodi.+ Pin. +	63.0 a	62.1 a	63.4 a	61.1 a	42.7 c	50.7 b	53.33 a	54.17 a	53.06 a	52.33 a	47.80 bc	46.07 cde
Flor. 250 cm^3	42.0 cd	42.3 c	41.5 c	41.3 d	37.4 cd	43.7 c	45.00 cd	44.27 c	44.67 c	43.67 c	41.03 d	42.33 de
Hand weeding	55.9 b	57.2 b	57.9 b	54.0 b	54.3 b	55.6 b	47.67 bc	49.17 b	47.03 b	49.67 ab	49.77 ab	50.13 bc
Un-weeded	38.7 d	36.3 d	37.4 d	40.3 d	34.1 d	39.5 d	41.33 d	40.07 d	39.67 d	38.67 d	40.80 d	40.83 e

Table 10: Effect of weed control treatments on grains yield (ardab/fed.) and straw yield (Ton/fed.) in different type soils in 2019/2020 and 2020/2021 seasons.

	Grains yield (ardab/fed.)						Straw yield (Ton/fed.)					
	Sandy		Calc.		Clay		Sandy		Calc.		Clay	
Treatment	2019/2020	2020/2021	2019/2020	2020/2021	2019/2020	2020/2021	2019/2020	2020/2021	2019/2020	2020/2021	2019/2020	2020/2021
Pyrox. 160 cm^3	12.13 e	12.70 e	11.67 e	13.40 e	23.90 a	22.87 ab	3.100 d	2.967 de	3.087 cde	3.130 de	4.970 a	4.873 a
Pyrox. 120 cm^3	21.33 ab	19.67 b	21.67 ab	22.63 ab	20.50 cd	18.87 d	4.767 ab	4.833 a	4.897 a	4.923 a	3.383 cd	3.437 cd
Pyrox. 80 cm^3 Mesos. +	14.37 d	14.57 cd	15.27 cd	16.57 cd	14.76 e	13.97 e	3.933 bc	3.867 b	3.820 b	4.033 ef	3.020 d	3.177 d
Iodo. 400 cm^3 Meso. +	13.33 de	13.90 cde	13.67 de	12.60 ef	25.49 a	23.87 a	3.167 c	3.233 c	3.010 de	3.163 d	5.247 a	5.133 a
Iodo. 300 cm^3 Meso. +	22.83 a	21.33 a	23.40 a	24.77 a	21.86 bc	19.10 cd	5.067 a	5.100 a	5.177 a	5.167 a	3.587 c	3.557 c
Iodo. 200 cm^3 Clodi.+ Pin. +	16.67 c	15.20 c	16.37 c	18.73 c	15.25 e	14.17 e	3.967 bc	3.900 b	3.537 bcd	3.770 c	3.217 cd	3.097 de
Flor. 500 cm^3 Clodi.+ Pin. +	13.17 de	13.37 de	14.33 cd	14.67 de	24.29 a	23.33 ab	3.133 cd	2.907 de	2.843 e	3.053 e	4.930 a	4.730 ab
Flor 375 cm^3 Clodi.+ Pin. +	20.90 ab	20.67 ab	22.50 ab	23.80 a	19.90 d	19.03 d	4.707 ab	4.767 a	4.943 a	4.950 a	3.457 cd	3.393 cd
Flor. 250 cm^3	15.17 cd	15.10 c	15.47 cd	18.67 c	13.72 ef	14.10 e	3.833 bc	3.933 b	3.730 bc	3.847 c	3.023 d	3.087 de
Hand weeding	20.33 b	19.33 b	20.90 b	21.00 b	22.29 b	21.47 bc	4.567 ab	4.507 ab	4.607 a	4.637 b	4.387 b	4.330 b
Un-weeded	9.17 f	9.40 f	8.23 f	10.67 g	12.75 f	11.47 f	3.033 e	3.070 d	3.023 de	3.027 f	3.000 d	2.967 e

pyrox.= pyroxsulam, mesos. + iodo. = mesosulfuron-methyl + iodosulfuron-methyl-sodium, clodi. + pin. + flor. = clodinafop-propargyl + pinoxaden + florasulam. Means followed by the same letters within each column do not differ significantly according to Duncan's Multiple Range test at the 5% level.

respect were found by Khaffagy *et al*. [37] indicated that plant height is a key factor that contributes significantly to grain yield because taller plants capture more light and therefore had more photosynthetic available for grain filling, which, positively rejected on biological improvements and higher productivity of grain yield.

Yield and its Components: Data in Tables (9 and 10) revealed that the herbicides of [pyroxsulam at 160 cm^3, (mesosulfuron-methyl 1% + iodosulfuron-methyl-sodium 0.2%) at 400 cm^3 and (clodinafop-propargyl 3% + pinoxaden 3% + florasulam 0.75%) at 500 cm^3 /fed] at recommended rates when applied in both soils (sandy and calcareous, sandy loam soil) were inversely related between the vegetative growth of wheat plants, yield and its components [Number of grains /spike, weight 1000 grains (g) and straw yield (ton/fed)]. Thus as the reduction on the vegetative growth of wheat plants (CGR and RGR rate) increases, yield and its components, whereas, the reduction in grain yield in both sites reached to (12.13, 13.33, 13.17 and 11.7, 13.6, 14.6 ardab /fed), respectively, in the first season. In this respect, Ahmad

et al. [38] found that the application of pyroxsulam inhibited the growth of wheat and reduced its yield. Also, Abdel-Wahab *et al*. [39] found that the application of pyroxsulam resulting in significant adverse effects on wheat grains.

While, there was a positive correlation, where with increasing in the rate of vegetative growth characters (CGR and RGR), yield and its components increased. This explained that the post-emergence herbicides of [pyroxsulam at 120 cm^3, (mesosulfuron-methyl 1% + iodosulfuron-methyl-sodium 0.2%) at 300 cm^3 and (clodinafop-propargyl 3% + pinoxaden 3% + florasulam 0.75%) at 375 cm^3/fed] at reduced rate 25% when applied in both soils (sandy and calcareous, sandy loam soil). the same previous herbicides at recommended rates applied in clay soil were the safest herbicide among the tested and they superiority on grain yield compared to other treatments, whereas, the increasing were; in sandy soil was (21.33, 22.83 and 20.90 ardab/fed.), in calcareous, sandy loam soil was (21.67, 23.40 and 22.50 ardab/fed.), and in the clay soil was (24.17, 24.49 and 24.29 ardab/fed.), respectively in the first season, the similar results were found in the second season. Consequently, the increasing in grain yield and its components may attribute to minimizing weed competition. So, the positive effect of weeded control practices on wheat yields and its components have been conformed with, El-Sobky and El-Naggar [40] they concluded that the increasing in grain yield was directly correlated with increase in yield components and decrease in density and dry biomass of weeds.

CONCLUSION

From the previous results showed that the herbicides [pyroxsulam, (mesosulfuron-methyl 1% + iodosulfuron-methyl-sodium 0.2%) and (clodinafop-propargyl 3% + pinoxaden 3% + florasulam 0.75%)] can used at a high dosage in clay soil. While, in sandy and calcareous, sandy loam soils or poor soils of organic matter can using the same herbicides at reduced rate 25%, which gave satisfactory weed control efficacy, in addition are safer for the growth, yield and its components of wheat crop.

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