European Journal of Agricultural and Rural Education (EJARE)
Available Online at: https://www.scholarzest.com
Vol. 3 No. 2, February 2022,
ISSN: 2660-5643

DEVISING A GUIDE TO THE FLOWERING WINDOW OF COMMON AND INTRODUCTION VARIETIES OF BREAD WHEAT (TRITICUM AESTIVUM L.) IN IRAQ

Ary Sulayman AL -Barwary [1*] & Abdullsattar Asmair Alrijabo[2]
[1*](Ministry of Agric. and Water Resources-Directorate of Res. and Extension-Erbil)
[2] (College of Agriculture and Forestry/ Mosul University, IRAQ)
This research is part 1 of PhD. Thesis of the 1st Author.

*Corresponding author email: ari84shele@hotmail.com

Article history:

Received: December 4th 2021
Accepted: January 6th 2022
Published: February 12th 2022

Abstract:

This study was conducted in 2019/2020 agricultural season in a high rainfall area in the Fayda sub-district, Dohuk governorate .The study included two factors; the 1st factor was 64 bread wheat varieties grown in Iraq, while the 2nd factor was the sowing date in two levels: early sowing before the fall of first heavy effective rain and late sowing after the fall of the first heavy effective rain. The interaction between sowing dates and studied varieties and its effect on the flowering window was studied by determining three basic growth stages according to the Zadoks scale, which were the end of booting stage (Z-49) when first awns visible, the beginning of anthesis growth stage (Z-61), and anthesis complete growth stage (Z-69). The most important results obtained in the field study on the effect of varieties and sowing dates in the flowering window, success to develop a guide for the ideal sowing dates for bread wheat varieties in Iraq by knowing the extent to which the productivity of these varieties is affected by sowing dates, and through that it was possible to classify them into three groups, the first group of varieties can planted before the first effective rain fall , the second after the first effective rain fall, and the third is neutral, and these results were according to early and late flowering based on the LSD values of the average varieties for the three growth stages under study.

Keywords: Flowering window-sowing date-Bread Wheat- Zadoks growth scale -Iraqi varieties

I. INTRODUCTION

The Zadoks scale is a relatively recent scale (1974) for diagnosing the growth development of cereal crops. It was invented by the Dutch plant pathologist Jan C. Zadoks in (1974) and the percentage scale runs from 00 to 99 (Zadoks, 1974).

According to that, the yield of grain in wheat does not depend on the date of sowing, but rather on the date of flowering. The researchers confirmed that usually in the conditions of spring sowing of wheat, the earlier varieties are preferred in order to avoid high temperatures during the stage of grain filling and maturity (Shaherly & Khaiti, 2011). Many research results conclude that the prediction of the flowering date for each variety and the selection of the appropriate variety for the appropriate sowing date is a guarantee of flowering the crop in the optimum period, which leads to maximizing the grain yield. (Whitford et al, 2013) & (Mühleisen et al, 2013) & (Langer & Longin, 2014), (Sprague et al, 2015), (Harris et al, 2016), Hunt et al, 2019), (Sandhu et al, 2020).

In studies of the response of different varieties of bread wheat to different sowing dates found superiority the first sowing date on (November10), (November15), (November20), (November 23), and (November10), respectively for the results of the researchers in terms of grain yield and number of days to flowering 50% of plants (Al-Aseel et al, 2018) & (Tahir et al, 2019). (Chauhan et al, 2020), (Aglan et al, 2020), (Al-Dhahi & Al-Taweel, 2021).

The cultivars derived for drought tolerance in hot regions should be earlier compared to the other cultivars (Yildirim & Bahar, 2016). There are significant differences between wheat cultivars in the number of days from planting to flowering stage (Rekani et al, 2017) .some results stated that for farmers to fully realize the benefits of early sowing, more emphasis is needed on breeding varieties that can achieve the best flowering date compatible with early sowing (Flohr et al, 2017) .Other research pointed out the need to organize between the sowing date of the various varieties and the date of their maturity, as it is the goal that will achieve maximizing the yield (Trainor et al, 2018) .It was emphasized that early flowering is one of the important traits in plant breeding programs and the selection of suitable cultivars for dry and semi-arid areas that are exposed to severe stress at the end of the plant's life cycle (Ochagavía

et al, 2019). The results of at the University of Tripoli Research Station during the 2017/2018 agricultural season showed there were significant differences between eight cultivars of bread wheat in the traits of the number of days up to 50% flowering and 50% maturity, biological yield, and grain yield. This indicates that the genetic structure has an effective impact in determining the date of sowing by knowing the flowering window of each variety (Zweik et al, 2020).

II. MATERIALS & METHODS:

This experiment was conducted during the agricultural season (2019-2020) in the fields of the Department of Seed Testing and Certification in Fayda District in Dohuk Province. This study aims to devise a national guide that determines the ideal dates for sowing local and introduced bread wheat varieties after knowing the flowering window for each of them based on the application of the Zadoks growth scale, and then classifying these varieties into early, medium or late maturity groups based on their growth stages according to the Zadoks scale.

The field experiment was designed as a factorial experiment with two factors: cultivars and sowing dates and with three replications according to the split-plot design in a randomized complete block design (R.C.B.D) using a GenStat program. The comparison between the averages was done using the LSD test at the level (0.05) to compare the means. Three stages of growth were studied for sixty-four cultivars of bread wheat (Triticum aestivum L.), under rainy conditions with two planting dates, the 1st before the first heavy rain fell on 11/22/2019, and the 2nd after it fell on 26 /12/2019.

Soil Analysis, Precipitation Rates and Temperature: A soil sample was taken from field at a depth of 0-30 cm before sowing for analysis and knowledge of the physical and chemical properties of the soil. The analyses were conducted in the environmental laboratories in Dohuk. The data of rainfall for Faida site were obtained from the Directorate of Agriculture of Dohuk Table (1). The maximum Temp was 30 C and minimum Temp was 8 C in the period between 1 April to 11 May at Dohuk, So it was not an effective stress factor on flowering window in this season.

Table (1) Soil analysis and rainfall ppt. in (2019-2020) season.

Measurement type	Value	Rain Monthly precipitation	mm.
pH	7.07	Oct. 2019	43.3
EC ds.m^{-1}	0.26	Nov. 2019	19.3
available Nitrogen mg.kg^{-1}	44.77	Dec. 2019	137.8
Organic Matter %	2.11	Jan. 2020	110.7
Available Phosphorous mg.kg^{-1}	15.39	Feb. 2020	101.7
Available Potassium mg.kg^{-1}	171.42	Mar. 2020	282.0
Clay %	30.50	Apr. 2020	68.5
Silt%	26.50	May 2020	16.2
Sand %	43.0	Total ppt. mm.	779.5 mm.
texture	Clay Loam		

The Zadoks growth scale was applied to all varieties to study three stages of growth, which are the end of booting growth stage Z-49, the beginning of anthesis growth stage Z-61, and the Anthesis complete growth stage Z-69, according to the Zadoks growth scale (Zadoks et al., 1974) and by studying the three stages of growth for all studied varieties. The cultivars were sequenced in terms of earliness and delay at each stage of growth. The grains of all cultivars were planted at a constant sowing rate of 300 grains.m-2 according to the recommendation of 7, and the field was fertilized with 80 kg.ha-1 DAP Di Ammonium Phosphate fertilizer with 80 kg.ha-1 Urea.

III. RESULTS & DISCUSSION:

1-Study of the end of booting growth stage Z-49 for bread wheat:

It is clear from Table (4) that the sowing date has a significant effect on the end-of-booting stage of Z-49 for bread wheat, as the second sowing date achieved the lowest average number of days to reach the end of the booting stage, its value was (108.88 days), significantly superior to the first sowing date, which achieved an average of (127.07 days).

The genetic factor also had an effective impact on the number of days to reach the stage of the flowering. The bread wheat varieties under study were divided according to the number of days to reach the end of the booting stage into six groups based on the LSD value of the varieties average, which is (3.61). The first group starting with variety Tal Afar 3 (110.67 days) and ending with variety Koya 20 (113 days), represented the group with the least number of days to reach the end of booting stage, followed ascendingly by the group (Bohouth 10 - Rabeah), then the third group (Bohouth 158 - Al-Rasheed), the fourth group (Ipaa 99 - Almadaeen), and the fifth group (Saberbek,

Dajlatolker, and Lancilillotto), while the varieties Rehana, Sofia, and Illico achieved the highest value for the number of days to reach the end of the booting stage with a value of (130, 131, 133 days) respectively.

The first sowing date in the Fayda site was on November 22, 2019, before the first heavy rain (Balla) fell in December, but this date benefited from the early rains before planting, which improved the water storage in the soil before planting (approximately 62.6 mm. during October and November), in addition to the appropriate temperatures during cultivation and the benefit of the crop from the heavy rainwater that fell in December.

Table (2) Effect of varieties and sowing dates of bread wheat on end of booting growth stage Z-49 (days after sowing)

	Varieties	Sowing Date		Average
		1st date	2nd date	
1	Illico	140.00	126.00	133.00
2	Sofia	140.67	120.5	130.59
3	Rayahnah	140.00	121.00	130.50
4	Lancelillotto	139.00	118.00	128.50
5	Dajlatolker	139.00	117.00	128.00
6	Saberbeak	136.00	115.00	125.50
7	Almadaeen	138.00	110.67	124.33
8	Falado	130.67	114.33	122.50
9	Kalar-1	129.00	113.00	121.00
10	Ipaa-99	127.00	114.67	120.83
11	Alrashed	128.33	112.67	120.50
12	Wafia	127.33	112.67	120.00
13	Kalar-2	133.67	105.67	119.67
14	Bankal	126.67	112.00	119.33
15	Alfatah	132.00	106.67	119.33
16	Alatefeyah	127.67	111.00	119.33
17	Deyar	132.33	104.67	118.50
18	Alrashedeyah	123.67	113.33	118.50
19	Boora	129.00	108.00	118.50
20	Tamoz-2	125.33	111.67	118.50
21	Noor	126.67	110.00	118.33
22	Mahdi	129.00	107.67	118.33
23	Jehan-99	126.67	109.67	118.17
24	Ding	126.00	110.33	118.17
25	Jawahar-1	128.33	108.00	118.17
26	Kalverto	126.00	109.33	117.67
27	Bohouth-4	127.33	108.00	117.67
28	Beebaz	128.33	107.00	117.67
29	Babal-113	126.33	109.00	117.67
30	Cham-6	126.67	108.33	117.50
31	Almahmoodeyah	129.00	106.00	117.50
32	Bahgdad-1	126.00	108.67	117.33
33	Alez-66	124.67	109.67	117.17
34	Adana-99	125.33	109.00	117.17
35	Erbil-2	126.00	108.00	117.00
36	Bohouth-158	132.33	101.67	117.00
37	Rabeah	123.33	110.00	116.67
38	Azmar	124.67	108.00	116.33
39	Arehane	124.67	108.00	116.33

40	**Azadi**	**124.67**	**107.67**	**116.17**
41	**Albarakah**	**123.67**	**108.67**	**116.17**
42	**Jarmo**	**122.00**	**110.00**	**116.00**
43	**Hsad**	**123.33**	**108.33**	**115.83**
44	**Wifi**	**128.33**	**103.33**	**115.83**
45	**Abu ghraib-3**	**124.67**	**107.00**	**115.83**
46	**Koya-4**	**123.33**	**108.00**	**115.67**
47	**Erbil-4**	**123.33**	**108.00**	**115.67**
48	**Aras**	**124.67**	**105.67**	**115.17**
49	**Attilla-50**	**124.33**	**106.00**	**115.17**
50	**Maroof**	**122.33**	**108.00**	**115.17**
51	**Aladnaneyah**	**124.67**	**105.00**	**114.83**
52	**Alfaris-1**	**122.00**	**107.00**	**114.50**
53	**Sulaymani-2**	**122.00**	**107.00**	**114.50**
54	**Bohouth-22**	**123.33**	**105.67**	**114.50**
55	**Tekin**	**124.00**	**104.33**	**114.17**
56	**Razkari**	**121.00**	**106.33**	**113.67**
57	**Koya-18**	**122.00**	**105.33**	**113.67**
58	**Xaneqeen**	**126.33**	**101.00**	**113.67**
59	**Bohouth-10**	**121.00**	**105.67**	**113.33**
60	**Koya-20**	**122.00**	**104.00**	**113.00**
61	**Alaa**	**121.00**	**103.67**	**112.33**
62	**Koya-8**	**119.00**	**102.67**	**110.83**
63	**Sherwana**	**121.33**	**100.33**	**110.83**
64	**Tal Afar-3**	**121.33**	**100.00**	**110.67**
	S. dates average	**127.07**	**108.88**	
	L.S.D. (0.05)			
	sowing date		**0.633**	
	varieties		**3.61**	
	sowing date varieties interaction		**5.105**	

These results are in agreement with what the researcher 3 stated that the genetic structure of the variety is what controls the direction of photosynthesis products towards storage and at all stages of growth, and agree with the results of 19 and 1 that there are significant differences between the Pakistani wheat varieties in the number of days until the emergence of 50% of the spikes, as the number of days in these varieties 104, 98, and 99 days respectively. And with what was confirmed by 25 that there are significant differences in the number of days from planting until the emergence of spikes between several varieties of soft wheat grown in Iraq, namely Ipaa 99, Sardar, Acsad, Cham-6 and Razkari. It also agrees with what was confirmed by 12 that there are significant differences in the trait of the end date of the booting among the varieties. The general average was 87.8 days, the earliest variety was Masoud 7 with 79.3 days, and the late variety was the local variety Macawy with 112 days.

In the interaction between the two factors , the highest average number of days to reach the end of booting stage (140.67, 140, and 140 days) was achieved in the interaction of the first sowing date with Sofia, Illico, and Rehana varieties, respectively, while the lowest average number of days to reach the end of booting stage was (100). Days in the interaction of the variety Tal Afar 3 with second sowing date.

2- Study of the beginning of anthesis growth stage Z-61 for bread wheat:

It is clear from Table (5) that the sowing date has a significant effect on the trait of the Z-61 stage for bread wheat, the second sowing date achieved an average number of days to reach the Z-61 stage , which amounted to (117.01 days), a significant superiority to the first sowing date, which achieved an average value of (135.19 days). The genetic factor also had an effective impact on the number of days to reach the Z-61 stage , as the bread wheat varieties under study were divided according to the number of days to reach the Z-61 stage into six groups based on the LSD value of the varieties average , which is (3.33), the first group represented Koya 8 (119 days) and Tal Afar 3 (119.17 days) the group with the least number of days to reach the Z-61 stage, followed by the group (Koya20 -

Bohouth4), then the third group (Atila50 - Almahmoodeyah), and the fourth group (Noor - Almadaeen), and the fifth group (Saberbek - Lancelillotto), while the varieties (Rehana, Dajlatolker, and Illico) achieved the highest value of the number of days to reach the Z-61 stage , with a value of (137.83, 138.67, 140.5 days), respectively.

These results agree with what was shown by 14 that there are significant differences between the varieties in the trait of flowering time, as the two varieties Noor and Cham-6 gave the highest averages for this trait, which reached 105.41 and 105.91 days, respectively. It agrees with what six indicated that there is a significant difference between the varieties in the trait of the number of days until 50% flowering. The results also agree with the classification of the researcher 21 of bread wheat varieties into five groups based on the date of flowering: the first group is the very early varieties (the period between the date of planting and the date of 50% of flowering was 119 days).

The second group is the early varieties (the period between the sowing date and the date of 50% of flowering was 124 days), the third group is the middle varieties (the period between the date of sowing date and the date of 50% of flowering was 131 days), the fourth group is the late varieties (the duration between the sowing date and the date of 50% of flowering was less than 138 days), the fifth group is the very late varieties (the period between sowing date and 50% of flowering was 155 days).

In the interaction between the two factors, the highest average number of days to reach the Z-61 stage (152.33, 152, and 150.67 days) was achieved in the interaction of the first sowing date with the varieties (Dajlatolker, Illico, and Rehana) respectively, while the lowest average number of days to reach the Z-61 stage was (109.67 days) in the interaction of the variety Tal Afar 3 with the date of the second sowing.

These results are in agreement with the findings of 4 in their study of the response of different varieties of bread wheat to four sowing dates (November 15, December 1, December 15, and January 1), as the first date of planting exceeded the number of days to reach the 50% of flowering, which amounted to 130.86 days, then the second date amounted to 120.33 days, then the third date was 114.43 days, then the late date was 108.43 days.

Table (5) Effect of varieties and sowing dates of bread wheat on the beginning of anthesis growth stage Z-61 (days after sowing)

varieties		sowing date		average
		1st date	2nd date	
1	Illico	152.00	129.00	140.50
2	Dajlatolker	152.33	125.00	138.67
3	Rayahnah	150.67	125.00	137.83
4	Lancelillotto	148.33	122.67	135.50
5	Sofia	148.00	121.33	134.67
6	Falado	146.00	122.33	134.17
7	Saberbeak	144.00	121.00	132.50
8	Almadaeen	146.00	116.00	131.00
9	Alrashed	139.33	121.67	130.50
10	Mahdi	138.33	122.33	130.33
11	Kalar-1	140.00	120.33	130.17
12	Alfatah	142.00	116.00	129.00
13	Kalar-2	141.67	115.33	128.50
14	Noor	136.67	119.00	127.83
15	Almahmoodeyah	140.67	114.33	127.50
16	Boora	137.00	118.00	127.50
17	Bankal	135.00	118.67	126.83
18	Wafia	136.00	117.67	126.83
19	Ipaa-99	134.33	119.33	126.83
20	Alatefeyah	135.00	118.00	126.50
21	Alfaris-1	134.33	118.67	126.50
22	Bohouth-158	139.67	112.67	126.17
23	Tamoz-2	133.00	119.33	126.17
24	Kalverto	132.33	119.67	126.00
25	Beebaz	138.00	114.00	126.00
26	Deyar	138.67	113.33	126.00
27	Jawahar-1	133.67	118.00	125.83
28	Maroof	132.67	118.67	125.67
29	Jehan-99	133.33	118.00	125.67
30	Jarmo	132.00	119.00	125.50
31	Erbil-2	132.00	119.00	125.50
32	Aladnaneyah	133.00	117.00	125.00
33	Bahgdad-1	131.67	118.33	125.00
34	Cham-6	133.67	116.00	124.83
35	Wifi	138.67	111.00	124.83
36	Babal-113	132.00	117.00	124.50
37	Alrashedeyah	131.67	117.00	124.33
38	Azadi	131.67	117.00	124.33
39	Azmar	132.67	115.67	124.17
40	Attilla-50	132.33	116.00	124.17
41	Bohouth-4	130.67	117.00	123.83
42	Alaa	132.33	115.33	123.83
43	Albarakah	129.00	118.33	123.67
44	Koya-4	131.33	116.00	123.67
45	Alez-66	131.00	116.00	123.50
46	Ding	132.00	115.00	123.50

47	Adana-99	130.67	116.00	123.33
48	Rabeah	130.67	116.00	123.33
49	Sulaymani-2	131.67	115.00	123.33
50	Bohouth-22	130.00	116.00	123.00
51	Abu Ghraib 3	131.00	115.00	123.00
52	Hsad	129.33	116.00	122.67
53	Erbil-4	130.00	114.00	122.00
54	Arehane	129.33	114.00	121.67
55	Razkari	128.33	115.00	121.67
56	Aras	130.33	113.00	121.67
57	Xaneqeen	130.00	113.33	121.67
58	Tekin	130.00	112.33	121.17
59	Sherwana	127.67	114.33	121.00
60	Bohouth-10	128.33	113.67	121.00
61	Koya-18	130.00	111.67	120.83
62	Koya-20	127.67	113.67	120.67
63	Tal Afar-3	128.67	109.67	119.17
64	Koya-8	127.00	111.00	119.00
	S. dates average	135.19	117.01	

L.S.D. (0.05)	
sowing date	0.58
varieties	3.33
sowing date varieties interaction	4.70

3-Study of the Anthesis complete growth stage Z-69 for bread wheat:

It is clear from Table (6) that the sowing date has a significant effect on the trait of Z-69 stage for bread wheat. The second sowing date achieved an average number of days to reach the Z-69 stage, which amounted to (120.66 days), significantly superior to the first sowing date, which achieved an average value of (139.25 days). Whereas the genetic factor was also effective on the number of days to reach the Z-69 stage, as the bread wheat varieties under study were divided according to the number of days to reach the Z-69 stage into six groups based on the LSD value of the varieties average , whose value is (3.395), the first group represented 11 varieties, starting with Koya 8 (122.33 days) and ending with Koya 20 (125.33), which is the least group in the number of days to reach the Z-69 stage, followed by group (Hasad - Babel 113), then the third group (Baghdad 1 - Alfatah), and the fourth group (Al-Rasheed - Saberbek), and the fifth group (Sofia - Rehana), while the two varieties (Illico and Dajlatolker) achieved the highest value of the number of days to reach the Anthesis complete stage, with a value of (144.67 and 143 days), respectively. These results are in agreement with the findings of 3 that the genetic structure of the variety controls the lifespan of each stage of growth, especially the post-flowering stages.

In the interaction between the two factors , the highest average number of days to reach the Z-69 stage (157.33, and 157, days) was achieved in the interaction of the first sowing date with the two varieties (Illico and Dajlatolker) respectively, while the lowest average number of days to reach the Z-69 stage was (113.33, and 115, and 115 days) in the interaction of the first sowing date with the varieties (Tal Afar 3, Koya 8, and Koya-18) respectively.

It is clear from Figure (3) and Figure (4) that the response of bread wheat varieties to sowing dates did not differ in terms of earliness or delay in growth stages, starting from the end of the booting stage Z-49 and ending with the stage of anthesis complete Z-69, as we note the varieties (Koya 8, Tal Afar 3, Bohouth 10, Shirwana, and Razkari) were at the forefront of the earliest varieties in the two dates of sowing, while the varieties (Illico, Dajlatolker, Lancelillotto, and Rehana) settled at the bottom of the sequence of late-flowering and then ripening and also at the two time of sowing.

Table (6) Effect of varieties and sowing dates of bread wheat on anthesis complete growth stage Z-69 (days after sowing)

varieties		sowing date		average
		1st date	2nd date	
1	Illico	157.33	132.00	144.67
2	Dajlatolker	157.00	129.00	143.00
3	Rayahnah	155.00	127.00	141.00
4	Lancelillotto	153.00	127.00	140.00
5	Falado	150.00	126.00	138.00
6	Sofia	151.67	124.00	137.83
7	Saberbeak	148.00	125.00	136.50
8	Almadaeen	150.00	120.67	135.33
9	Kalar-1	143.67	123.67	133.67
10	Alrashed	141.67	125.67	133.67
11	Alfatah	147.00	119.00	133.00
12	Mahdi	140.67	125.33	133.00
13	Kalar-2	146.33	118.67	132.50
14	Boora	141.67	121.67	131.67
15	Bankal	139.67	123.00	131.33
16	Ipaa-99	137.67	125.00	131.33
17	Jehan-99	138.67	123.67	131.17
18	Beebaz	143.50	118.67	131.08
19	Almahmoodeyah	143.33	118.67	131.00
20	Kalverto	138.00	124.00	131.00
21	Noor	139.33	122.33	130.83
22	Alfaris-1	138.67	123.00	130.83
23	Wafia	139.67	121.67	130.67
24	Tamoz-2	137.67	123.67	130.67
25	Bohouth-158	142.67	117.67	130.17
26	Maroof	138.00	122.33	130.17
27	Deyar	143.00	117.00	130.00
28	Erbil-2	137.33	122.33	129.83
29	Al latefeyah	139.00	120.33	129.67
30	Bahgdad-1	137.00	122.33	129.67
31	Babal-113	136.00	122.33	129.17
32	Al adnaneyah	137.00	121.00	129.00
33	Jarmo	137.00	121.00	129.00
34	Azmar	138.33	119.67	129.00
35	Jawahar-1	137.33	120.33	128.83
36	Alrashedeyah	135.33	121.67	128.50
37	Attilla-50	137.00	119.67	128.33
38	Cham-6	138.00	118.67	128.33
39	Wifi	140.67	115.00	127.83
40	Albarakah	133.67	121.67	127.67
41	Bohouth-4	135.00	120.33	127.67
42	Alaa	135.33	119.67	127.50

43	Bohouth-22	135.33	119.67	127.50
44	Koya-4	135.33	119.00	127.17
45	Sulaymani-2	135.33	118.67	127.00
46	Ding	136.00	118.00	127.00
47	Alez-66	134.33	119.67	127.00
48	Azadi	134.33	119.67	127.00
49	Rabeah	134.33	119.33	126.83
50	Adana-99	134.33	119.00	126.67
51	Abu Ghraib 3	134.33	118.67	126.50
52	Erbil-4	134.67	117.67	126.17
53	Hsad	132.33	119.67	126.00
54	Koya-20	133.00	117.67	125.33
55	Xaneqeen	134.67	116.00	125.33
56	Arehane	132.33	118.00	125.17
57	Aras	134.33	116.00	125.17
58	Koya-18	134.33	115.00	124.67
59	Tekin	133.00	116.00	124.50
60	Sherwana	131.67	117.00	124.33
61	Razkari	130.67	118.00	124.33
62	Bohouth-10	131.67	116.33	124.00
63	Tal Afar-3	131.33	113.33	122.33
64	Koya-8	129.67	115.00	122.33
	S. dates average	139.25	120.66	

L.S.D. (0.05)	
sowing date	0.595
varieties	3.395
sowing date varieties interaction	4.801

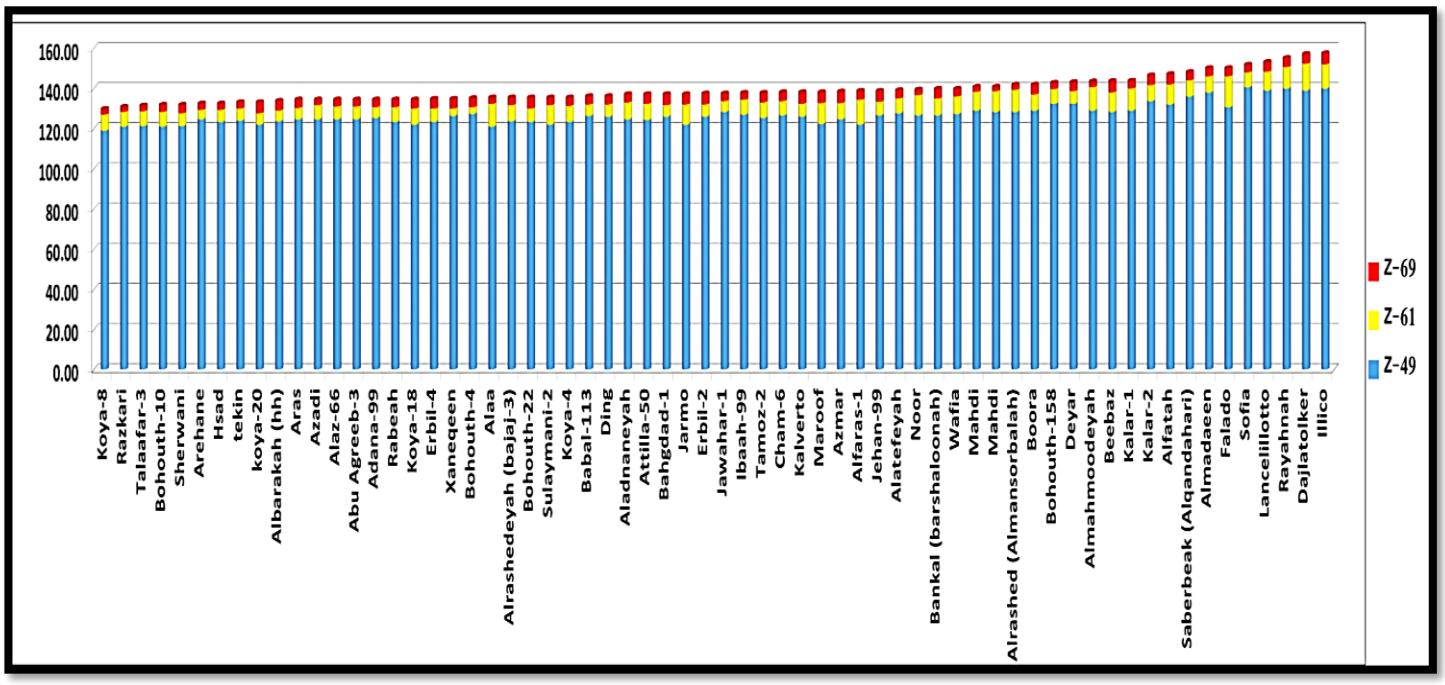

Figure (3) the number of days of the three growth stages of bread wheat varieties at the first sowing date

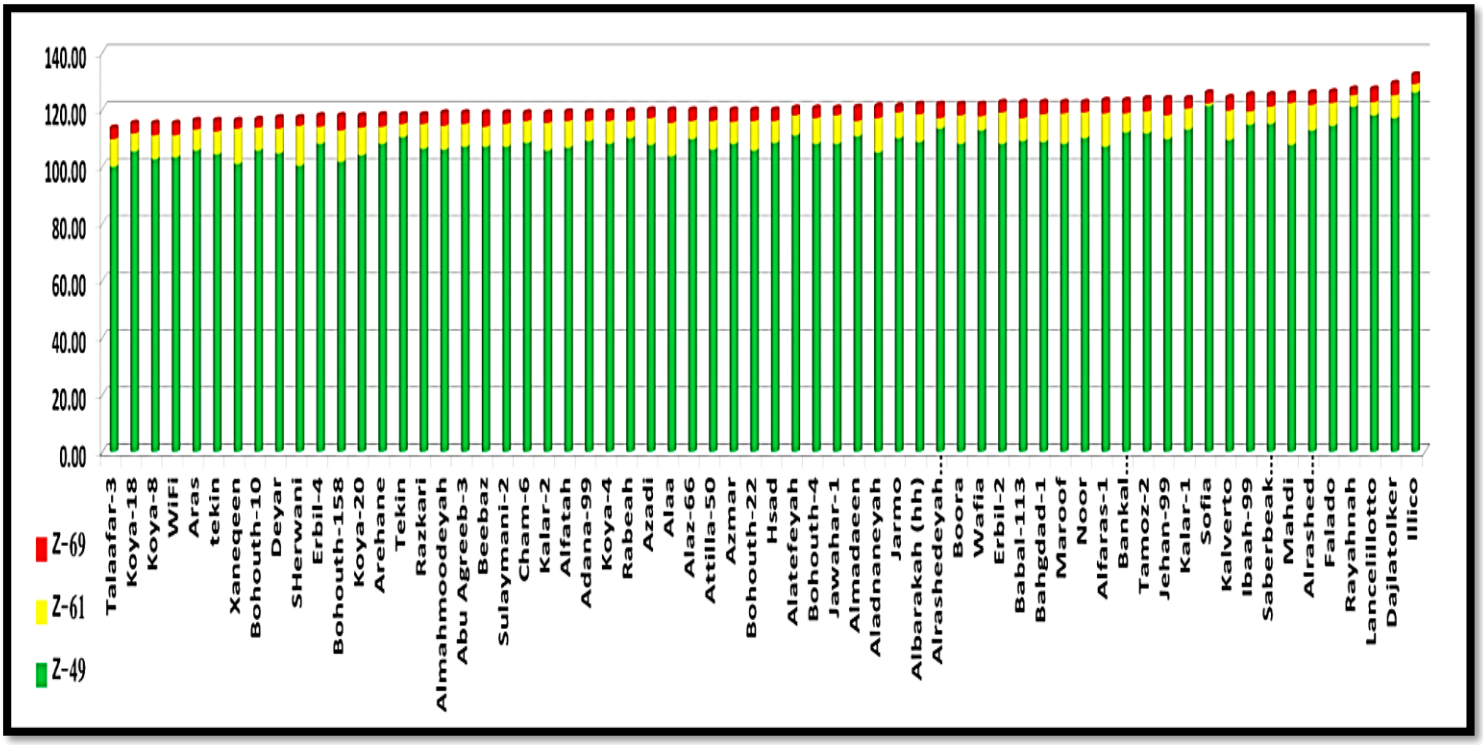

Figure (4) number of days of the three growth stages of bread wheat varieties at the second sowing date

4-CONCLUSION

According to the foregoing results, we conclude that it is possible to divide the bread wheat varieties into three groups, which are an inferred guide for the dates of sowing bread wheat varieties in Iraq (Ary and Alrijabo guide 2022) according to Appendix (1).

Appendix: (1) Ary and Alrijabo guide (2022) for the ideal dates for Cultivation of bread wheat varieties in Northern Iraq

A group of varieties that are planted late after the first effective rain falls	The group of neutral varieties grown on both dates without affecting the yield	A group of varieties that are planted early before the first effective rain falls	
Maroof	Al latefeyah	Mahdi	Albarakah
Koya-18	Kalverto	Beebaz	Alaz-66
Bohouth-158	Kalar-1	Dajlatolker	Rayahnah
Koya-8	Bohouth-10	Jawahar-1	Adana-99
Kalar-2	Almahmoodeyah	Saberbeak	cham6
Sherwana	Razkari	Babal-113	Boora
Baghdad-1	Aras	Temoz-2	Attila-50
Lancelillotto	Bohouth-22	Illico	Abu Ghraib-3
Bohouth-4	Rabeah	Erbil-4	Alaa
Bankal	Sulaymani-2	Jehan99	WIFI
Deyar	Ipaa .99	Koya-20	Jarmo
Alfaris-1	Al-Fatah	Azadi	Arihan
Sofia	Noor	Alrashed	Hsad
Tal Afar-3	Wafia	Falado	Koya-4
	Almadaeen	Erbil-2	Xaneqeen
		Aladnaneyah	Ding
		Alrashedeyah	Azmar
			Tekin

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