



## Study of some yield characteristics of genotypes of Sudanese millet under different planting dates

Nour Muhammad Sabbar Sayel and Shaima Ibrahim Mahmoud Al-Rifai  
College of Agriculture, Al-Muthanna University, Al-Muthanna, Iraq.  
E-mail: agrpl.grad.noormohamed@mu.edu.iq

Received on 1/11/2022 Accepted on 05/12/2022 Published on 1/03/2023

### Abstract

A field experiment was carried out in Al-Suwayr district, which is far from the center of Samawa governorate (18 km), In a farmer's field during the spring season of 2022 to study the planting dates for four millet cultivars introduced from Sudan (Ashana, Cardvana, Wedalbasher, Icm77004) The experiment was applied using the split split plots design, according to a Randomized Complete Block Design (R.C.B.D) with three replicates, where the planting dates solved the main panels and the varieties occupied secondary panels, the results of the experiment showed Where the Icm77004 cultivar excelled in weight of one 1000 grains, grain yield, bio-yield and protein content with averages of 7.897 g, 1.565 tons ha<sup>-1</sup>, 12.297 tons ha<sup>-1</sup> and 13.40%, respectively.

The first date, March 22, was superior in many characteristics, including grain yield, biological yield, and protein ratio, with averages of 1.466 tons ha<sup>-1</sup> and 11.584 percent, respectively. The fourth date, 20 April, was superior in weight of one 1000 grains, with an average of 6.713 g.

The interaction between Wedalbasher cultivar on the first date, March 22, grain yield and protein content, with averages of 1.821 tons ha<sup>-1</sup> and 11.777%, outperformed the Icm77004 cultivar on the fourth date, April 1, in the trait of the weight of one 1000 grains, with an average of 10.280 g.

**Keywords:** genotypes, Millet, dates, Wedalbasher, protein

### Introduction

Millet *Panicum miliaceum* is one of the most important ancient grain crops. It was used in China, India, Sudan, Egypt, and many other regions of the world as food for humans. In the Middle Ages, millet was one of the main food crops for the poor in Europe, as it was called (the crop

of the poor) and millet is grown either as green fodder or to produce seeds or both, and its seeds are used in making bread in America and Arab countries. Green fodder is used to feed animals, and the surplus is used to make hay and silage. Although millet has lost part of its importance during the past 100 years, it will remain as food

for humans in some regions of the world for a long time. Hassanein. Millet is one of the sources for millions of people, especially those who live in hot and dry areas of the world, then wheat, rice, sorghum, and potatoes replaced millet. After rice, sorghum, and wheat (Maurya et al., 2016; Hassanein, 2019).

It has been observed in Iraq that the increase in production is due to horizontal expansion, so we need new and modern means that contribute to increasing crop production by increasing productivity per unit area and thus achieving vertical expansion—increasing the yield by identifying the varieties with the highest productivity and the appropriate planting time. The planting date has a significant impact on the growth and development of crops, which is then reflected in the production and quality of the crop.

### Materials and methods

The experiment was carried out in the lands of a farmer in Al-Suwayr district, about (18 km) from the center of Samawah governorate, during the spring agricultural season of 2022, in clay-textured ground.

Six lines make up the unit, and there is a 50 cm gap between each line. 20 holes are included on each line. Ten centimeters separate each hole from the next. The calibration irrigation was irrigated and left until the appropriate dryness for the cultivation process. 3 seeds were placed in one hole. The slipping process was carried out 20 days after planting. One plant remained in Al-Joura. Irrigation and weeding were carried out whenever needed. Urea (N 46%) fertilizer was used as a source of nitrogen with a fertilizer recommendation of 120 kg N ha<sup>-1</sup> in three batches, one at emergence, the second in the elongation stage, and the third in the end stage, and the usual superphosphate fertilizer was used. As a source of phosphorous (46% P<sub>2</sub>O<sub>5</sub>), 60 kg of P ha<sup>-1</sup> was added, and a swarm was added at one time when planting a swarm next to the seeds. Potassium sulfate (50% K<sub>2</sub>O) was used as a source of potassium, including 40 kg of K ha<sup>-1</sup>. Random samples were taken based on (Page et al., 1983) in the Department of Soil and Water Sciences- College of Agriculture- Al-Muthanna University, and Table (1) shows the characteristics of the studied soil.

<b>Table No. (1) Physical and chemical properties of soil</b>		
<b>Adjective</b>	<b>value</b>	<b>measuring unit</b>
<b>(PH)</b>	<b>7.6</b>	<b>-</b>
<b>(EC)</b>	<b>4</b>	<b>dsi siemens-1</b>
<b>N</b>	<b>15.7</b>	<b>µg gm-1</b>
<b>P</b>	<b>16.37</b>	<b>µg gm-1</b>
<b>K</b>	<b>210.19</b>	<b>µg gm-1</b>
<b>O.M</b>	<b>1.3</b>	<b>%</b>
<b>CEC</b>	<b>6.5</b>	<b>mEq/L</b>

## Results and discussion

### 1-Components of the result

#### 1.1 Weight of 1000 grains (g)

The results of the statistical analysis indicate the significant effect of the varieties, dates, and the interactions between them on the characteristic of the weight of 1000 grains.

It is noted in Table (1) the moral superiority of the ICM177004 variety in the characteristic of the weight of a 1000 grains, as it gave the highest average of 7.897 g, followed by Wedalbasher variety with an average of 7.257 g. It, in turn, was superior to Ashana cultivar, which gave an average of 5.927 g, while the local variety recorded the lowest average of 3.204 g, lower than All varieties. The reason for the superiority of the varieties over each other is due to the low number of inflorescences in the Sudanese varieties, usually one inflorescence. This leads to the accumulation of nutrients in the seeds, leading to an increase in their weight relative to the local variety, whose

number of inflorescences ranges from (3-5).

The results of Table (1) show the moral superiority of the fourth date 4/20 in the trait of the weight of a 1000 grains, as it gave an average of 6.713 g, then came second to the second date 1/4, which gave an average of 6.199 g, which in turn outperformed the first date 3 / 22, which amounted to 5.864 g While the third date gave 4/10 the lowest average of 5.511 g, this result agreed with (Al-Abadi, 2006).

As for the interaction, it was shown from the results of Table (1) the moral superiority of the variety ICM77004 planted on the fourth date, 4/20, over all the interactions, where the average weight of one 1000 grains reached 10.280 g While the significant decrease in the interactions of the local variety is observed in all planting dates compared to other varieties, and the lowest average weight of one 1000 grains for the local variety grown on the fourth date was 4/20, the lowest average was 2,400 g.

The results of Table (2) show the

<b>Table (1) The effect of varieties and planting dates and the interaction</b>					
<b>Varieties</b>	<b>planting dates</b>				<b>Average</b>
	<b>D1</b>	<b>D2</b>	<b>D3</b>	<b>D4</b>	
<b>Ashana</b>	<b>6.960</b>	<b>5.277</b>	<b>5.667</b>	<b>5.807</b>	<b>5.927</b>
<b>Wed albasher</b>	<b>5.357</b>	<b>9.547</b>	<b>5.763</b>	<b>8.363</b>	<b>7.257</b>
<b>ICM177004</b>	<b>6.970</b>	<b>7.000</b>	<b>7.340</b>	<b>10.280</b>	<b>7.897</b>
<b>local variety</b>	<b>4.170</b>	<b>2.973</b>	<b>3.273</b>	<b>2.400</b>	<b>3.204</b>
<b>average</b>	<b>5.864</b>	<b>6.199</b>	<b>5.511</b>	<b>6.713</b>	
<b>L.S.D . values</b>	<b>varieties</b> <b>0.4141</b>		<b>planting dates</b> <b>0.004</b>		<b>overlap</b> <b>0.7334</b>

### 1.2 Grain yield (t ha-1)

This statistical analysis result statistical analysis results indicate the significant effect of varieties, dates, and their interactions on the trait of grain yield.

The results of Table (2) show that the two cultivars ICM177004 and Wed albasher recorded the highest averages of grain yield, with an average of 1.565 and 1.520 tons.ha-1, significantly superior to all cultivars. The results also indicate the moral superiority of Ashana cultivar over the local cultivar, which recorded the lowest average grain yield, reaching averages are 1.304 and 0.583 t ha-1, respectively, and these traits positively affect grain yield. This result agreed with (Fentie, 2012) and Sawsan (2020), which indicated the difference in yield in different varieties.

moral superiority of the first date 3/22 in the trait of grain yield, as it gave an average of 1.466 tons.ha-1 on the third date 4/10 and the fourth 20/4, as the averages of each reached 1.174 and 1.197 tons.ha-1 on the sequence without any significant differences between them, while the second date gave 1/4 the lowest average amounted to 1.162 tons.ha-1.

As for the overlap, Table (2) show the moral superiority of Wed albasher cultivar planted on the first date 22/3 with an average of 1.821 tons.ha-1 without significant differences with Ashana cultivar planted on the first date with an average of 1.800 tons.ha-1 overall interactions, while the variety recorded On the first date, the local average was 0.464 tons. H-1. It is clear from the results that the grain yield of the rolled varieties from Sudan decreased with the delay of the

planting date as a sign of exceeding the first date by giving the highest average

grain yield compared to the other varieties.

<b>Table (2) The effect of varieties and planting dates and the interaction between them on the characteristic of grain yield (tons.ha-1)</b>					
	<b>planting dates</b>				<b>varieties</b>
<b>Average</b>	<b>D4</b>	<b>D3</b>	<b>D2</b>	<b>D1</b>	
<b>1.304</b>	<b>1.148</b>	<b>1.198</b>	<b>1.069</b>	<b>1.800</b>	<b>Ashana</b>
<b>1.520</b>	<b>1.701</b>	<b>1.250</b>	<b>1.309</b>	<b>1.821</b>	<b>Wed albasher</b>
<b>1.565</b>	<b>1.311</b>	<b>1.445</b>	<b>1.724</b>	<b>1.779</b>	<b>ICM177004</b>
<b>0.583</b>	<b>0.520</b>	<b>0.754</b>	<b>0.594</b>	<b>0.464</b>	<b>local variety</b>
	<b>1.170</b>	<b>1.162</b>	<b>1.174</b>	<b>1.466</b>	<b>average</b>
<b>overlap</b> <b>0.1569</b>	<b>planting dates</b> <b>0.1267</b>		<b>varieties</b> <b>0.0652</b>		<b>L.S.D . values</b>

### 1.3 Biological yield (ton.ha-1)

The statistical analysis result statistical analysis results indicate the significant effect of cultivars, planting dates, and their interactions on the trait of biological yield.

Table (3) showstable (3) results show that the ICM177004 and Ashana cultivar recorded the highest averages of the biological yield, reaching 12.297 tons.ha-1 and 12,000 tons.ha-1, outperforming all varieties. The results also show the superiority of Wed

albasher, with an average of 10.668 tons.ha-1, over the variety. The local recorded the lowest average of 2.954 tons.H-1.

Table (3) show the moral superiority of the first date, 3/222, as it recorded the highest average of 11.934 tons.h-1, superior to the third dates 4/10 and the second 1/4, which did not differ morally from each other, and their averages reached 9.094 and 8.843 tons.h-1 respectively, while The fourth date recorded 20/4, the lowest average

of 8,049 tons.h-1, lower than all planting dates.

As for the interaction between the varieties and the dates, Table (3) results show that Ashana cultivar was planted on the first date, 22/3, with an average of 17,200 tons. H. 1- Overall the interactions, while the local variety

recorded in the first date 22/3, the lowest average amounted to 2.497 tons. H. -1. The biological yield is the final product of the dry matter (straw and grain) before and after flowering. Therefore, the reason for the superiority of Ashana cultivar grown on the first date, 22/3 is the superiority in grain yield of the variety

	planting dates				Varieties
Average	D4	D3	D2	D1	
12.000	8.807	12.793	9.200	17.200	Ashana
10.668	9.900	10.480	9.440	12.853	Wed albasher
12.298	10.900	9.607	13.500	15.187	ICM177004
2.954	2.590	3.497	3.233	2.497	local variety
	8.049	9.094	8.843	11.934	average

#### 1.4 Percentage of protein in grains (%)

The results indicate the significant effect of varieties and dates and their interaction on the protein content.

Table (4) showable (4) shows that the cultivars ICM177004, wedalbasher, and Ashana recorded the highest averages of 10,847, 10.792, and 10.788%, respectively, while the local variety recorded the lowest average of 10.091%. Among the types of millet

and varieties, according to the genetic structure of each.

The results of Table (4) show the moral superiority of the first date, 22/3 for the characteristic of protein content with the highest average of 11.584% over the second date, 4/1 with an average of 11.128%, which in turn outperformed the third date 4/10 with an average of 10.116%, while the fourth date recorded the lowest average It reached 9.690%. The reason for the dates is the difference in climatic conditions and germination rates and

seedling stage, and the high protein content indicates the high nutritional value. This result does not agree with (Al-Abadi, 2006 and Obaid and others, 2019).

The results of Table (4) on the interaction between cultivars and dates

show that Wedalbasher cultivar planted on the first date 22/3 with the highest average of 11.777% over all the interactions, while the local cultivar planted on the fourth date gave the lowest average of 8.697%.

<b>Table (4) The effect of varieties, planting dates, and the interaction between them on the percentage of protein(%)</b>					
	<b>planting dates</b>				<b>varieties</b>
<b>average</b>	<b>D4</b>	<b>D3</b>	<b>D2</b>	<b>D1</b>	
<b>10.788</b>	<b>10.227</b>	<b>10.603</b>	<b>11.073</b>	<b>11.250</b>	<b>Ashana</b>
<b>10.792</b>	<b>10.310</b>	<b>9.593</b>	<b>11.487</b>	<b>11.777</b>	<b>Wed albasher</b>
<b>10.847</b>	<b>9.527</b>	<b>10.727</b>	<b>11.210</b>	<b>11.923</b>	<b>ICM177004</b>
<b>10.091</b>	<b>8.697</b>	<b>9.540</b>	<b>10.740</b>	<b>11.387</b>	<b>local variety</b>
	<b>9.690</b>	<b>10.116</b>	<b>11.128</b>	<b>11.584</b>	<b>average</b>
<b>Overlap</b> <b>0.4419</b>	<b>planting dates</b> <b>0.3557</b>		<b>varieties</b> <b>0.1843</b>		<b>L.S.D . values</b>

### Conclusions

1- All cultivars gave a high grain yield, but the best of them was the Icm77004 variety, where the Icm77004 outperformed in the weight of one 1000 grains, grain yield, vital yield, and protein content with averages of 7.897 g, 1.565 tons.ha-1 and 12.297 tons.ha-1 and 13.40% on the relay

2-Sowing dates differed significantly in grain yield, the best of which was the first and fourth dates, where the first date, 22 March, was superior in

many characteristics, including grain yield, vital yield, and protein ratio, with averages amounting to 1.466 tons. It reached 6.713 g.

3- The cultivars showed differences in grain yield with different planting dates, as the interaction between Wedalbasher cultivar on the first date of March 22nd was superior to grain yield and protein content with averages of 1.821 tons.ha-1 and 11.777%, respectively, and the superiority of Icm77004 on the fourth date, April 1 in

the trait of the weight of one 1000 grains, with an average of 10 .280 gr.

### References

**Al-Abadi, Munther Khammas Jabbar. 2006.** Effect of different levels of sulfur and potassium on grain yield and its components for two sexes of millet. Master Thesis. College of Agriculture - University of Baghdad

**Baltensberger, D.D. 2002.** Soil testing and Fertilization of proso millet with nitrogen, phosphorus, potassium, and other nutrients are discussed. Issud in Furtherance of cooperative extension work, U.S.A., Depart. Of Agriculture, Univ. Of Nebraska, file G 89-924 under field crops

**Fekira, Abdo Bakri Ahmed. 2001.** The effect of some agricultural operations on the yield and quality of fodder for American millet and sorghum crops. Ph.D. thesis - College of Agriculture - University of Baghdad

**Hassanein, Abdel Hamid Mohamed. 2019** Grain production, Faculty of Agriculture. Al-Azhar University, first edition, p. 250.

**Maurya, S. K., Nath, S., Patra, S. S., & Rout, S. 2016.** Effect of different sowing dates on growth and yield of pearl millet (*Pennisetum glaucum* L.) varieties under Allahabad condition. Seed, 9, D3V3.

**Obaid, Sally Shaker, Kazem Hassan Hudhali, and Haitham Abdel Salam Ali 2019.** The effect of planting dates and distance between lines on the growth, yield and quality of forage for the blueberry crop *Panicumvirgatum* Al-Muthanna Journal of Agricultural Sciences, Volume 7 (3): 263-270.

**Page, A. L.; Miller, R. H., and Keeney, D. R., 1982.** Methods of Soil analysis. Part (2) 2nd. Ed. American Soc. of Agron. Crop. Sci. Soc. of Agronomy. USA.

**Sawsan, H. K., Bakhit, O. A., & Ahmed, T. E. 2020.** Effect of sowing techniques on yield and productivity of pearl millet in gardud soil of north Kordofan state. Journal of Agricultural Sciences (Belgrade), 65(1), 37-46