Effect of Some Planting Depths on Wheat Characteristics for Two Varieties (Iba’a 99 and Alnoor)

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Abstract

The impact of sowing depth in planting machine (Nordsten type) on wheat varieties (VW-Iba’a 99 and VW-Alnoor) were tested during planting machine at three sowing depths of SD-5.4, 7, and 8.6 cm. The experiments were conducted in a factorial experiment under a complete randomized design with three replications. The wheat cultivar (VW-Iba’a 99) was meaningfully better than (VW-Alnoor) in all studied parameters. For (VW-Iba’a 99), the germination ratio, length plant, plant vigor index, root length, root fresh weight, root plant dry, and grain yield, were 90.36%, 68.04 cm, 57.14%, 17.09 cm, 1.42 g, 0.54 g, and 4.441 tha-1, respectively. The sowing depth (SD -5.4cm) was significantly better than (SD-7 and 8.6cm) in all studied parameters. The greatest assessments have come from the overlap among the SD -5.4cm, and VW_Iba’a 99.

Keywords: Mechanical damage, Nordsten type, Sowing depth, Wheat varieties (Iba’a 99 and Alnoor), Wheat quality.

1. Introduction

Wheat (Triticum aestivum L.) is one of the strategical cereal crops in the world and in Iraq in particular due to its great importance to the human life as it occupies a huge part of the main daily food because it is a major source of energy and nutrition. The wheat crop necessity lays in its grains used for producing bread that is the indispensable food to most of the world’s people [1]. Therefore, in the future, there is need to produce nutritive agricultural produce rich in protein and other essential nutrient required to the human and animal consumption that is why emphasis should be laid on production [2] . [3] Confirmed in their study that seeding depth and distances had a significant effect on all growth characteristics for the wheat crop at 4 cm planting depth and 8 cm seeding distance. This is as a result of providing the largest distance for roots to spread and obtaining the highest nutrients for the plant during the growth period [4]. The cultivation and productivity of any crop area are affected by mechanical treatments such as soil preparation processes, plowing, leveling, loosening, hoeing, and other mechanical operations. These treatments are important to create suitable soil germination. It is preferable to carry out mechanical operations to suit the type of soil and the crop to be planted from the depths of plowing and soil moisture without effect the soil’s physical properties. This is reflected positively in the growth and productivity of the crop [5].

Preparing the appropriate place for seed germination depends mainly on mechanical processes that have an effective effect on increasing the growth characteristics of the cultivated crop and thus providing better distances for the growth of roots inside the soil and increasing the yield. It is reflecting positively the lower costs of all mechanical operations that were adopted in preparing the soil for planting[6]. [7] the effects of different tillage methods for maize on some soil physical properties and yield were investigated. The results showed that tillage methods were significant as regards crop yields, and the highest yields for the wheat [8]. The mechanic unit (tractor + plow) is considered the backbone of any agricultural operation. In addition to that, the type of machine is chosen to accomplish the required work which depends on the soil type and the crop. Because the tillage operations are accomplished by two primary plowing operations which are breaking the deaf layer and showing a large dirt mass on the surface. Secondary tillage prepares the seedbed by using smoothing machines disc harrows that produce a smoother surface finish for seeds growth [9] and [10]. The productivity of any crop is affected by many factors including the type and size of seeds, climatic conditions, fertilizers, the soil physical properties, and the Sowing depth. Wheat production may be affected by factors including the use of low-yielding varieties and poor-quality seed, poor disease and pest management, inadequate soil fertility [11]. [12] concluded that the studied crop characteristics such as the number of grains per spike, plant height, and crop yield are closely related to the mechanical processes that follow during the growth periods of the crop. There is a clear increase in vegetative growth and its components with the mechanical processes. The low planting depths play a major role by giving the highest percentage of germination and height to the plant. The reason for this is the availability of suitable conditions for plant growth from soft soil, air, and water with light cultivation depths.
The main goal of this research is to study the impact of two varieties (Alnoor and Iba’a 99), and Sowing depth (SD), on some properties of wheat yield.

2. Materials and Methods

This study was conducted in 2020 to evaluate the performance of the sowing machine (type Nordsten). The VW-Alnoor and VW-Iba’a 99 varieties were selected for the experiments. Three sowing depths at levels 5.7cm, and 9cm, taken soil moisture with 12cm depth, and the depth of the sowing machine for determining the moisture content of the soil at 13-15%. The Nordsten type machine was a Sowing speed of 2.652 km hr⁻¹, according to the method used by [14].

This study Massy Ferguson -290 tractor with a horsepower 80 hp was used with four cylinders with mold board plow on depth 0.12-0.15 m to stir the soil and create a suitable place for seed growth, were calculated for each running test:

2.1. List of Abbreviations and Symbols

| SMo | soil moisture |
| VW | Varieties of wheat |
| SD | Sowing depth |
| SS | Sowing speed |
| Mf-290 | Massy Ferguson -290 |
| H | Hour |
| Ha | Hectare |
| Hp | Horse power |
| PR | Penetration Resistance |
| BD | Bulk density |
| VWA | Crop type average |
| SD | Sowing depth average |
| SMA | Sowing methods average |
| LSD | Least square difference |

Soil texture: Soil separators were estimated by the pipette method mentioned in [15], [16].

### Table 1. Soil texture in the field of experiment.

| Soil texture | Sand (gm.kg⁻¹) | Silt (gm.kg⁻¹) | Clay (gm.kg⁻¹) |
|--------------|----------------|----------------|---------------|
| Silty caly   | 136            | 424            | 440           |

### Table 2. Soil characteristics of the experiment field.

| Smo (%) | SD (cm) | PR (kN.m⁻²) | BD (Mg.m⁻³) |
|---------|---------|-------------|-------------|
| 13-15%  | 5.4     | 1534.09     | 1.31        |
| 13-15%  | 7       | 1675.32     | 1.33        |
| 8.6     | 1833.42 | 1.41        |

2.2. The crop and its components

2.2.1. Germination percentage

Germination ratio is taken ten number of plants growing in one square meter in three replications [17].

2.2.2. Plant height

Wheat height is measured by a ruler from the soil surface till the plant end, in three replications [18].

2.2.3. Plant vigor index (PVI)

\[ P_{VI} = \frac{P_{L} \times \sigma_{P}}{100} \]
Where; PVI: plant vigor index cm, \( P_L \): plant length cm, \( G_p \): Germination percentage. [5].

2.2.4. Root length

It was calculated after ten plants were uprooted, at the end of the ripening stage of the crop, randomly selected with three replications. [12,15].

2.2.5. Grain yield

The samples random were taken for 25 plants in one square meter and calculate crop production in three replications. according to the method used by [19,20].

The results were analyzed statistically by using the randomized complete block design RCBD and the difference among treatments for each factor was tested according to the least significant difference L.S.D test [21].

3. Results and Discussion

The results showed that the VW-Iba’a 99 had the highest germination ratio of 90.369\% compared to VW-Alnoor that gives the lowest germination ratio of 89.257\% (Figure 1). The increasing SD leads to the decrease in germination ratio and which was 91.206, 89.799, and 88.435\%, respectively. The reason is to provide good germination conditions with low planting depth [14, 16] (Table 3). The interaction among Iba’a 99, and SD-5.4cm was the best (91.602\%).

Figure 2 showed that the VW-Iba’a 99 had the highest length plant average of 68.04cm compared to VW-Alnoor gave the lowest length plant of 65.21 cm. The increasing SD leads to the decrease in length plant and which was 69.97, 67.70, and 63.71 cm, respectively [14, 3] (Table 3). The interaction among VW-Iba’a 99, and SD- 5.43 cm was the best (70.76 cm). Increasing SD leads to the decrease in plant vigor index (PVI) and which was 61.16, 57.09, and 50.84 \%, respectively (Figure 3) that the VW-Alnoor had the lowest plant vigor index (PVI) average of 55.58\% % compared to VW-Iba’a 99 gave a high ratio of plant vigor index (PVI) 57.14 \%. [9], [7] (Table 3). The interaction among VW-Iba’a 99, and SD-5.4cm was the best (61.52 \%).

![Figure 1](image1.png)

**Figure 1.** Impact of VW and SD on germination ratio.

![Figure 2](image2.png)

**Figure 2.** Impact of VW and SD on length plant.
Increasing SD leads to a decrease in root length and which was 17.84, 16.92 and 15.09 cm respectively (Figure 4). The VW-Alnoor had the lowest root length average of 16.14 cm compared to VW-Iba’a 99 gave the highest ratio of root length of 17.09 cm. The reason for this is the availability of suitable conditions for plant growth from soft soil, air, and water with light cultivation depths [10], [11] (Table 4). The interaction among VW-Alnoor and SD-5.4cm was the best (18.54 cm).

**Table 3.** Effect of VW and SD on germination parameters

| VW       | SD Cm | Germination ratio % | Length plant cm | Plant Vigor Index (PVI) |
|----------|-------|---------------------|------------------|------------------------|
| Iba’a 99 | 5.4   | 91.602              | 70.76            | 61.52                  |
|          | 7     | 90.081              | 69.15            | 58.27                  |
|          | 8.6   | 89.425              | 64.22            | 51.65                  |
|          | 5.4   | 90.810              | 69.18            | 60.80                  |
| Alnoor   | 7     | 89.516              | 66.25            | 55.92                  |
|          | 8.6   | 87.445              | 63.19            | 50.03                  |
| VWA      | Iba’a 99 | 90.369           | 68.04            | 57.14                  |
|          | Alnoor | 89.257              | 65.21            | 55.58                  |
| SDA      | 5.4   | 91.206              | 69.97            | 61.16                  |
|          | 7     | 89.799              | 67.70            | 57.09                  |
|          | 8.6   | 88.435              | 63.71            | 50.84                  |
| LSD=0.05 | VW    | 1.416               | 1.502            | 2.601                  |
|          | SD    | 1.324               | 1.446            | 2.558                  |
|          | VW * SD | 1.566            | 1.518            | 2.708                  |

Figure 5. An increase in the SD leads to a reduction in the root fresh weight and the assessments were 1.44, 1.42, and 1.39 g respectively. Low SD provides all growth necessities from freshening and food for the plant[12]. The VW-Iba’a 99 was evocatively best than VW-Alnoor. The assessments were 1.42 and 1.41 g respectively. The growth situation was bad with soil wetness decreased for its effect on the spread of roots[17] (Table 4). The greatest assessments (235.16 g) have come from the overlap among the SD - 5.4 cm, and VW-Iba’a 99.

Increasing SD leads to the reduction in root dry weight and which was 0.61, 0.53, and 0.46 g respectively (Figure 6). The VW-Alnoor had the lowermost root dry weight average of 0.52 g compared to VW-Iba’a 99 gave a maximum ratio of root dry weight of 0.54 g[6] (Table 4). The interaction among VW-Iba’a 99, and SD-5.4cm was the best (0.62 g).

Figure 7 showed that the VW-Iba’a 99 had the uppermost grain yield average of 4.441 to the 1 compared to VW-Alnoor gave the lowermost grain yield of 4.346 to the 1, the increasing SD leads to the reduction in grain yield and which was 4.963, 4.196 and 4.022 the 1 respectively [5] (Table 4). The interaction among VW-Iba’a 99, and SD- 5.43 cm was the best (5.009 ha 1).
Table 4. Effect of VW and SD on grain yield and root growth parameters.

| VW  | SD cm | Root length cm | Root fresh weight g | Root dry weight g | Grain yield t/ha<sup>+</sup> |
|-----|-------|----------------|---------------------|------------------|-----------------|
| Iba’a 99 | 5.4  | 18.54          | 1.44                | 0.62             | 5.009           |
|       | 7    | 17.01          | 1.42                | 0.54             | 4.265           |
|       | 8.6  | 15.73          | 1.39                | 0.48             | 4.051           |
|       | 5.4  | 17.14          | 1.43                | 0.60             | 4.916           |
| Alnoor | 5.4  | 17.14          | 1.43                | 0.60             | 4.916           |
|       | 7    | 16.82          | 1.42                | 0.51             | 4.128           |
|       | 8.6  | 14.46          | 1.38                | 0.44             | 3.994           |
| VWA   | Iba’a 99 | 17.09      | 1.42                | 0.54             | 4.441           |
|       | Alnoor | 16.14         | 1.41                | 0.52             | 4.346           |
| SDA   | 5.4  | 17.84          | 1.44                | 0.61             | 4.963           |
|       | 7    | 16.92          | 1.42                | 0.53             | 4.196           |
|       | 8.6  | 15.09          | 1.39                | 0.46             | 4.022           |
|       | VW   | 1.21           | N.S                  | 0.13             | 0.121           |
|       | SD   | 1.19           | N.S                  | 0.11             | 0.104           |
| LSD=0.05 | VW *SD | 1.33        | N.S                  | 0.14             | 0.243           |

Conclusions

The wheat cultivar, Iba’a 99 was meaningfully best than the wheat cultivar, Alnoor in all studied parameters. The sowing depth of 5.4cm was meaningfully superior from two levels sowing depth of 7 and 8.6 cm in all studied parameters. The greatest assessments have come from the overlap among the sowing depth of 5.4cm, and wheat cultivar, Iba’a 99.
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