# A study some rice growth properties under impact practical speed and tillage depth

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**Abstract:**

The effect of practical speed and tillage depth was studied on some mechanical properties for tillage machine ( moldboard plow type ) and soil physical properties on Rice Jasmine variety at two practical speed levels of 2.681Km.hr$^{-1}$and 3.562 Km.hr$^{-1}$ and three levels of tillage depth of (10, 14and 22cm) .The experiments were carried out in a factorial experiment under randomized complete block design with three replications. The results showed that the practical speed of 2.681 Km.hr$^{-1}$is significantly better than the practical speed levels of 3.563 Km.hr$^{-1}$ as well as tillage depth 10cm was significantly superior to the other two tillage depth 14 and 22 cm in all studied parameters except fuel consumption and field efficiency . The results showed fuel consumption of 9.762 and 8.599 L.ha$^{-1}$ , field efficiency of 76.407 and 77.287 % ,slippage percentage of 8.796 and 8.002% , germination percentage 95 and 98% , plant height 74.9 and 75.5 cm ,the plant branches number 4 and 6 branch/plant, 100-grain weight 19.18and 19.58 g and grain yield 3.200 and 3.273t.ha$^{-1}$ for practical speed levels of 2.861 Km.hr$^{-1}$ and tillage depth 10 cm , respectively

**Keywords :** Rice , moldboard plow ,Soil physical properties , speed , Tillage depth.

## دراسة بعض خصائص نمو الرز تحت تأثير السرعة العملية وعمق الحراثة

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**الخلاصة :**

دراسة تأثير السرعة العملية وعمق الحراثة على بعض الخواص الميكانيكية لآلة الحراثة (نوع المحراث المطرحي القلاب) والخواص الفيزيائية للتربة على صنف الرز ياسمين بمستويين من السرعة العملية ( 2.681 كم / ساعة و 3.562 كم / ساعة ) وثلاثة مستويات من عمق الحراثة (10 ، 14 و 22 سم). وقد أجريت التجارب في تجربة عاملية تحت تصميم كتلة كاملة عشوائية وبثلاث مكررات. أظهرت النتائج أن السرعة العملية 2.681 كيلومتر / ساعة أفضل بكثير من مستويات السرعة العملية 3.563 كم / ساعة ، وبينما عمق الحرث 10 سم ، كانت أعلى بكثير من عمقي الحراثة الآخرين 14 و 22 سم في جميع الصفات المدروسة باستثناء استهلاك الوقود والكفاءة الحقلية. استهلاك الوقود بنسبة 9.762 و 8.599 لتر/هكتار، والكفاءة الحقلية 76.407 و 77.287 ٪ ، وانزلاق النسبة المئوية 8.796 و 8.002 ٪ ، ونسبة الإنبات 95 و 98 ٪ ، وارتفاع النبات 74.9 و 75.5 سم ، وعدد التفرعات 4 و 6 فروع / نبات ، وزن الف حبة 19.18 و 19.58 غم وانتاجية المحصول 3.200 و 3.273 طن /هكتار لمستوى السرعة العملية 2.861 كم / ساعة وعمق الحراثة 10 سم ، على التوالي

**الكلمات الافتتاحية: الرز ، المحراث المطرحي القلاب ، الخواص الفيزيائية للتربة ، السرعة ، عمق الحراثة**

## 1.Introduction

Rice is an important crop which is in the third rank after wheat and barley due to the area planted and production. Also, rice is considered as a vital food material for more than half of the world's population. . It is estimated that the requirement of rice production for Iraq, here as the production is grossly inadequate to meet the requirement, the productivity of rice in the current level is sub-optimal, requirement is met from the neighboring states.

Boloor et al .,( 2013) showed that different methods of tillage have significant

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effect on yield and field of product yield ,under impacted soil physical properties . that the moldboard plow was significantly better than the disk plow in all some growth characteristics under impact soil moisture and tillage depth (Mutlak ,2018).,Soil tillage is the quality that enables a soil to provide the proper nutrients, in the proper amounts and in the proper balance, for the growth of specified plants when other growth factors such as light, temperature, moisture and the soil physical condition . High fertility soil tillage depend on plow type and this further implies an increase in the range of crops that can be grown ( Alsharifi et al ,2019 ). The final rice cultivation system in the world is affected by the water deficiency, the low suitable land, and shortages of worker , Direct seeding of rice is the water- and labor-saving technique of cultivation It eliminates the need of seedling rising, maintaining and subsequent transplanting. In addition to higher economic returns (IRRI,2008) .

The rice grain quality is defined in two different criteria. Study of Alsharifi et al.(2017) ,showed that the planting' basis of quality is dependent upon total recovery and the proportion of head , while the consumers base their concept of quality on the grain appearance, size and shape of the grain .Jassim and Salih . (2007) , showed that a furrow opener is an important component of a seed drill or a planter. In general, a furrow opener cuts a furrow and allows the seeds to be deposited before being partially covered with soil. The types of furrow openers used vary with soil type and operating conditions, Common types of furrow openers used for minimum and no tillage systems are hoe, chisel and disc type openers stated that rice is marketed under three market types designated as long-grain, medium-grain, and short-grain. Varieties of each grain types must conform within narrow limits to the size and shape specifications established for that type. Thus, grain size and shape are among the first criteria of rice quality that breeders consider in developing new varieties for release in commercial production and this depended on transplanting methods . (Alsharifi et al .,2016) .

The economic liberalization was a positive role in increasing rice production through horizontal expansion to increase the cultivated rice area The basic technique of tillage and tillage operation is consists in returning the soil so that the lower part of soil is brought to the surface .Soil tillage , where it serves as the primary nutrient base for plants, (Alsharifi and Sarah,2018),The lowest grain weight was recorded from the crop established with direct seeding of dry seed. reported lower grain weight in direct seeding of dry seed on flat soil than other planting methods of rice.(Awan et al.,2007). There was significant difference in producing grain yield . reported 10% higher yields in direct seeded rice than flooded transplanting. Higher yield in direct seeding of sprouted seed treatments are attributed to good crop conditions ,was greater effect when using the mouldboard plow on physical soil properties cultivator. ( Kargas and Londra,2014) .

The main goal of this research is to study the effect of speed and tillage depth on some mechanical properties for moldboard plow and rice growth properties .

## 2.Materials and methods

This study was conducted in 2019 , to evaluate Anter -71 machine with moldboard plow , the experiments were done at two levels of practical speed 2.681 and 3.563 Km.h$^{-1}$ and three tillage depth 10, 14 and 22 cm . The moldboard plow ,was selected for the experiments of the plow organized on certain 22 cm depth by hydraulic device for tractor and soil moisture 18% using the pipette methods .

### 2.1. Mechanical characteristics

#### 2.1. 1. Fuel consumption

The fuel consumption was calculated as follow ( Alsharifi ,and Sarah 2018) .

$$Q_F = \frac{Q_D \times 10000}{W_P \times D \times 1000}$$

Where : $Q_F$ fuel consumed amount L\ ha , $Q_D$ fuel consumed amount for treatment length

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(40 m) , $W_P$ machine width (m) , D treatment length (40 m) .

**2.1.2.Field efficiency**

Field efficiency is the ratio of practical productivity to theoretical productivity , the field efficiency value is less than one . (Ahmed. 2012)

$$\mathrm{EF}_E = \frac{E_{FC}}{T_{FC}} \times 100$$

Where : $E_M$ : Machine efficiency (%) , $E_{FC}$: ratio of effective field capacity (%).; $T_{FC}$ : percentage of theoretical field capacity (%) .

**2.1.3. Slippage percentage**

Measured by the practical and theoretical speed ( Ahmed ,2012)

Practical speed : After tillage depth determination in the experiment the plow hacked in the soil with practical speed 3.563 km .hr$^{-1}$ , within treatment length ( 40 m) for both soil moisture and tillage depth in three replication. The practical speed was calculated as follow .

$$V_P = \frac{3.6 \times D}{T_P}$$

Where : $V_P$ practical speed Km.hr$^{-1}$ , $T_P$ practical time (hr) .

Theoretical speed : Without plowing the soil , only the weapon touches the soil, with speed 3.563km.hr$^{-1}$ within treatment length ( 40 m) for both soil moisture and tillage depth in three replication. was used for calculation of theoretical speed

$$V_T = \frac{3.6 \times D}{T_t}$$

Where : $V_T$ theoretical speed Km.hr$^{-1}$ , $T_t$ theoretical time (hr) .

The slippage percentage calculated using two speeds the practical and theoretical

$$.S = \frac{V_t \times V_p}{V_t} \times 100$$

**2.2. Physical properties :**

**2.2.1 Soil moisture :**

Samples were taken to measure soil moisture in the surface layer, 10 cm ,14 cm and 22 cm . Soil samples were weighted and drying in oven with 105˚C . The moisture content of soil samples , was calculated as follow (Al Sharifi and Sarah 2018).

$$W = \frac{W_W}{W_S} \times 100$$

Where : $W$ :Is soil moisture percentage , $W_W$ : Is weight wet soil , $W_S$ : Is weight dry soil .

**2.2.2.Soil bulk density**

For measuring bulk density, three soil samples from different parts of the land were collected using the pipette method. The collected samples were immediately put in plastic bags to conserve moisture during transferring to the laboratory and weighed it, then dried at 105 ˚C for 48 hr. Mass of dried soils was weighted, Soil bulk density was determined by (Langston ,2014 ).

$$P_b = \frac{M_S}{V_T}$$

Where : $P_b$ : Dry bulk density (mg. m$^{-3}$) , $M_S$ :weight of the dried soil sample (mg) , $V_T$: total volume of the soil sample (m$^3$ ) .

**2.2.3. Total soil porosity** .

The total porosity of soil samples collected for each treatment was calculated using following equation , an assumed particle density of 2.65 mg.m$^{-3}$. was calculated as follow (Anna ,Jacobs et al, 2010)

$$T_{SP} = \left(1 - \frac{P_b}{P_S}\right) \times 100$$

Where : $T_{SP}$ : total soil porosity (%) , $P_b$ : dry bulk density (mg.m$^{-3}$) , $P_S$ : partial density (mg.m$^{-3}$ ) , and shown in the table below .

**2.2.4.Soil penetration resistance**

Soil penetration resistance was measurement by soil penetration resistance device (pocket penetrometer ) for sites nine selected randomly ,with all tillage depth and soil moisture in three replications.

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Table I. Experiment field properties

| practical speed Km.hr$^{-1}$ | Depth tillage cm | Soil bulk density Mg.m$^{-3}$ | Total soil porosity % | Soil penetration resistance Kpa |
|---|---|---|---|---|
| **2.681** | 10 | 1.33** | 49.81** | 1002** |
| | 14 | 1.38 | 47.92 | 1144 |
| | 22 | 1.44 | 45.66 | 1455 |
| **3.563** | 10 | 1.37** | 48.30** | 1043** |
| | 14 | 1.49 | 43.77 | 1234 |
| | 22 | 1.54 | 41.88 | 1543 |

The influence of soil moisture and tillage depth on soil bulk density , total soil porosity and soil penetration resistance was shown in Table. **I** . All the interactions are significantly different and the best results (1.33 Mg.m$^{-3}$, 49.81% and 1002 Kpa) have come from the overlap among moldboard plow, 2.681 Km.hr$^{-1}$ practical speed and 10cm tillage depth . while gives the interactions between among moldboard plow, 2.681 Km.hr$^{-1}$ practical speed and 10cm tillage depth the best results (1.37Mg.m$^{-3}$ , 48.30% and 1043 Kpa).

Table II. Soil minutes volumes analysis in the experiment field

| practical speed Km.hr$^{-1}$ | Tillage depth Cm | Silt | Clay | Sand | Soil tissue |
|---|---|---|---|---|---|
| | 10 | 480 | 360 | 160 | |
| **2.681** | 14 | 480 | 350 | 170 | |
| | 22 | 490 | 360 | 150 | |
| **Av** | | 483.33 | 356.67 | 160 | Silt Clay loam |
| **3.563** | 10 | 490 | 350 | 160 | |
| | 14 | 480 | 380 | 140 | |
| | 22 | 460 | 380 | 160 | |
| **Av** | | 476.67 | 370 | 153.33 | Silt Clay loam |

**2.3.The crop and its components :**

**2.3.1. Germination percentage :**

Percentage of germination is found for plants number growing in one square meter in three replications .

**2.3.2. plant height**

Rice height are measured by bar or ruler from soil surface till the plant end, in three replications .

**2.3.3. Number of branches**

Taken 25 of plants growing in one square meter and calculated branches number, each for plant in three replication (Jaddoa and Baqir, 2012)

**2.3.4. 1000-grain weight** .

The random samples were taken for ten and calculated 1000- grain weight in one square meter in three replications (Jaddoa & Baqir, 2012).

**2.3.4.Grain yield .**

The samples random were taken for 25 plants and calculated grain yield in one square meter in three replications (Mutlak, 2018)

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 (Oehlent, 2010)


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## 3.Results and discussion

### 3.1. Fuel consumption

The influence of tillage depth on fuel consumption is shown in Table. 1.The tillage depth at 10 cm showed the highest fuel consumption of 8.599 L.ha$^{-1}$ , while the lowest fuel consumption of 11.706 L.ha$^{-1}$ was for 22 cm tillage depth . Because the high pressure on moldboard plow during tillage process leads to fuel consumption increased . These findings are consistent with the findings of (Alsharifi et al ,2019). It is indicated that the fuel consumption of the level 3.563Km.hr $^{-1}$practical speed is significantly better than level 2.681Km.hr$^{-1}$ practical speed , the results were 9.362 and10.833 L.ha$^{-1}$ respectively . The interaction among moldboard plow, tillage depth 10cm and practical speed of 3.563Km.hr$^{-1}$ gave best result (8.066L.ha$^{-1}$) .The level of the fuel consumption at different conditions is show in Fig. **1** for tillage depth and practical speed for tractor .

**Table1 The effect of practical speed and tillage depth on fuel consumption. L.ha$^{-1}$**

| practical speed Km.hr$^{-1}$ | Tillage depth cm | | | Means of practical speed Km.hr$^{-1}$ |
|---|---|---|---|---|
| | 10 | 14 | 22 | |
| **2.681** | 9.133 | 11.047 | 12.318 | 10.833 |
| **3.563** | 8.066 | 10.126 | 11.094 | 9.762 |
| **LSD=0.05** | | | | 1.062 |
| **Means of tillage depth cm** | 8.599 | 10.587 | 11.706 | |
| **LSD=0.05** | | 1.154 | | |

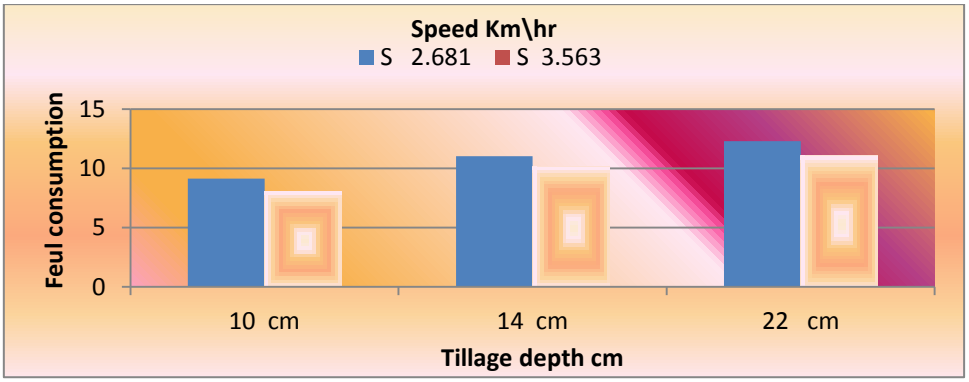


*Fig 1. The effect of practical speed and tillage depth on the fuel consumption L.ha$^{-1}$*

### 3.2. Field efficiency

Table **2** shows the influence of tillage depth on the field efficiency % . At tillage depth of 10 cm has the highest machine efficiency of 77.287%, and tillage depth of 22 cm has the lowest machine efficiency of 72.773% . Increased pressure on the plow when increasing tillage depth and this reflected negatively on field efficiency .These results are consistent with the results of (Alsharifi and Sarah,2018). It is indicated that the field efficiency of the practical speed 3.563Km.hr-1is significantly better than practical speed 2.681Km.hr-1the results were 76.407 and 73.430 % respectively . This is due to the efficiency of the moldboard plow in the work achieved and less time .These results are consistent with the results of (Ahmed. 2012) . The interaction among moldboard plow, tillage depth 10cm and practical speed of 3.563Km.hr-1 gave best result (78.901%) .The level of the field efficiency at different conditions is show in Fig. **2** for tillage depth and practical speed for tractor .


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**Table 2 The effect of practical speed and tillage depth on field efficiency %.**

| practical speed Km.hr$^{-1}$ | Tillage depth cm | | | Means of practical speed Km.hr$^{-1}$ |
|---|---|---|---|---|
| | 10 | 14 | 22 | |
| **2.681** | 75.673 | 73.092 | 71.526 | 73.430 |
| **3.563** | 78.901 | 76.311 | 74.010 | 76.407 |
| **LSD=0.05** | | | | 2.153 |
| **Means of tillage depth cm** | 77.287 | 74.702 | 72.773 | |
| **LSD=0.05** | | 2.476 | | |

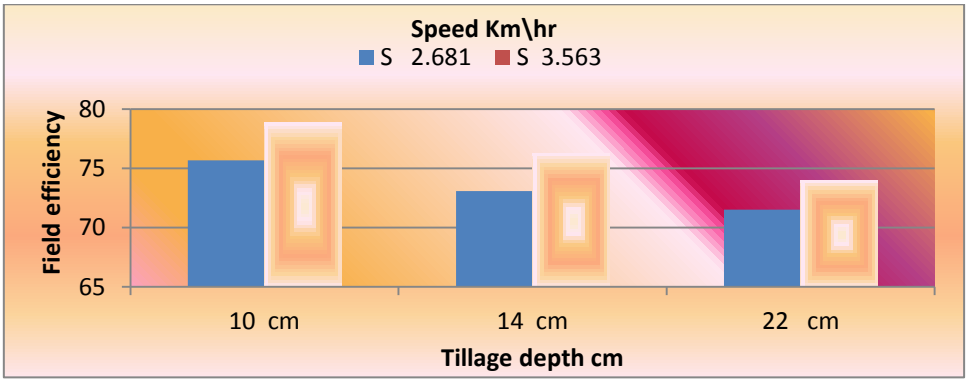


*Fig 2. The effect of practical speed and tillage depth on the field efficiency %*

### 3.3.Slippage percentage

The influence of tillage depth on the slippage percentage % . At tillage depth of 10 cm has the lowest slippage percentage of 8.002%, and tillage depth of 22 cm has the highest slippage percentage of 11.320%. When increasing tillage depth , reduce the cohesion between wheels and soil hence slippage ratio increased . From Table **3**, it is indicated that the slippage percentage of the practical speed 2.681 Km.hr$^{-1}$ is significantly better than practical speed 3.563Km.hr$^{-1}$.the results were 8.796 and 10.440 % respectively .These results are consistent with the results of (Alsharifi and Sarah 2018) . The interaction among moldboard plow, tillage depth 10cm and practical speed of 2.681Km.hr$^{-1}$ gave best result (7.216%) .The level of the slippage percentage at different conditions is show in Fig. **3** for tillage depth and practical speed for tractor.

**Table 3The effect of practical speed and tillage depth on slippage percentage %.**

| practical speed Km.hr$^{-1}$ | Tillage depth cm | | | Means of practical speed Km.hr$^{-1}$ |
|---|---|---|---|---|
| | 10 | 14 | 22 | |
| **2.681** | 7.216 | 8.963 | 10.211 | 8.796 |
| **3.563** | 8.788 | 10.104 | 12.429 | 10.440 |
| **LSD=0.05** | | | | 1.403 |
| **Means of tillage depth cm** | 8.002 | 9.534 | 11.320 | |
| **LSD=0.05** | | 1.895 | | |


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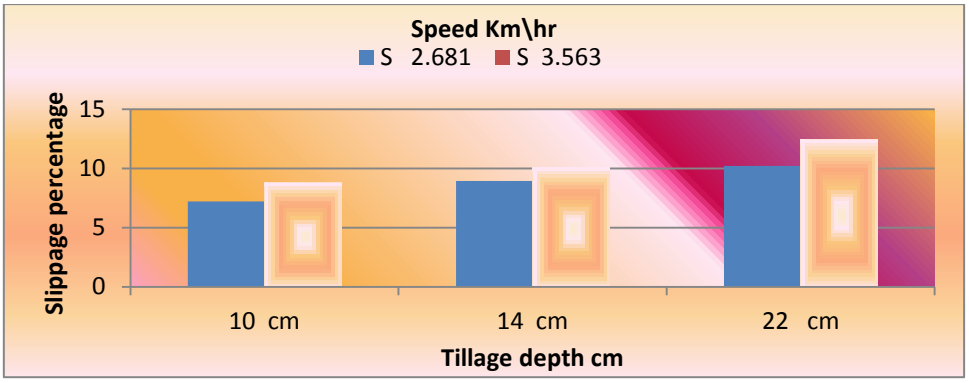


*Fig 3. The effect of practical speed and tillage depth on the slippage percentage %*

### 3.4.Germination percentage

Table **4** shown the increase in tillage depth leads to decrease germination percentage being 98, 93 and 91% respectively for different levels of tillage depth. Because increasing tillage depth led to reduced the soil physical properties and reflected negatively on the germination percentage for rice crop .These results are consistent with the results of (Jaddoa and Baqir, 2012) .The practical speed of 2.681 Km.hr$^{-1}$ resulted in the highest germination percentage (95%) and at the practical speed of 3.563Km.hr$^{-1}$ indicated the lowest germination percentage (93%). The interaction among moldboard plow , tillage depth 10 cm and practical speed of 2.681Km.hr$^{-1}$ gave best result (98%) . The level of the germination percentage at different conditions is show in Fig. **4** for tillage depth and practical speed for tractor.

**Table 4 The effect of practical speed and tillage depth on germination percentage %.**

| **practical speed Km.hr$^{-1}$** | **Tillage depth cm** | | | **Means of practical speed Km.hr$^{-1}$** |
|---|---|---|---|---|
| | 10 | 14 | 22 | |
| **2.681** | 98 | 94 | 92 | 95 |
| **3.563** | 97 | 92 | 90 | 93 |
| **LSD=0.05** | | | | 1.933 |
| **Means of tillage depth cm** | 98 | 93 | 91 | |
| **LSD=0.05** | | 2.024 | | |

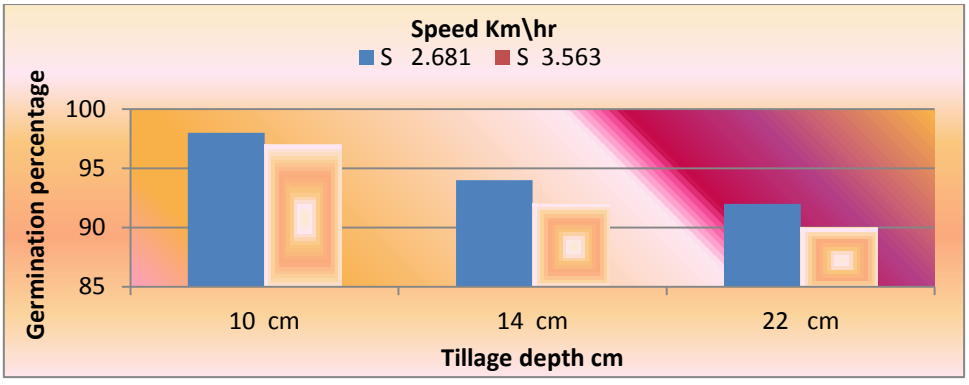


*Fig 4. The effect of practical speed and tillage depth on germination percentage %*


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### 3.5.Plant height

The increase in tillage depth leads to decrease plant height being 75.5, 73.8 and 71.6 cm respectively for different levels of tillage depth. Decreased physical properties of soil when increasing the tillage depth and this is reflected negatively on plant height. These results are consistent with the results of (Alsharifi et al ,2020). From Table **5** .The practical speed of 2.681Km.hr$^{-1}$ resulted in the highest plant height (74.9 cm) and at the practical speed of 3.563 Km.hr$^{-1}$ indicated the lowest plant height (72.3 cm).The interaction among moldboard plow ,tillage depth 10cm and practical speed of 2.681Km.hr$^{-1}$ gave best result (77.4cm) . The level of the plant height at different conditions is show in Fig. **5** for tillage depth and practical speed for tractor.

**Table 5 The effect of practical speed and tillage depth on plant height cm.**

| **practical speed Km.hr$^{-1}$** | **Tillage depth cm** | | | **Means of practical speed Km.hr$^{-1}$** |
|---|---|---|---|---|
| | 10 | 14 | 22 | |
| **2.681** | 77.4 | 74.9 | 72.4 | 74.9 |
| **3.563** | 73.6 | 72.7 | 70.8 | 72.3 |
| **LSD=0.05** | | | | 2.003 |
| **Means of tillage depth cm** | 75.5 | 73.8 | 71.6 | |
| **LSD=0.05** | | 2.144 | | |

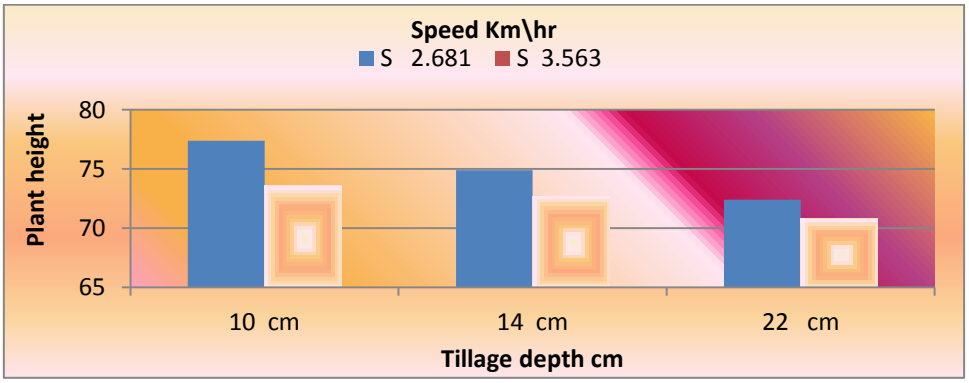


*Fig 5. The effect of practical speed and tillage depth on plant height cm .*

### 3.6.The plant branches number

The influence of tillage depth and speed on the plant branches number , is shown in Table **6**. The increasing the tillage depth leads to decreasing of the plant branches number , the results were 6 ,4and 3 branch/ plant, respectively for different levels of tillage depth , This is due to hinder root growth with increasing soil moisture and decreasing plant branches number . increasing the speed leads to decrease the plant branches number , and the results were 4 and 3 branch/ plant , respectively for different levels of speed .These results are consistent with the results that gained by (Jaddoa and Baqir , 2012).The interaction among moldboard plow , tillage depth 10cm and speed of 2.681Km.hr$^{-1}$ gave best result (6 branch/ plant) . The level of the plant branches number at different conditions is show in Fig. **6** for speeds and tillage depth .


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**Table 6 The effect of practical speed and tillage depth on the plant branches number branch/ plant**

| practical speed Km.hr$^{-1}$ | Tillage depth cm | | | Means of practical speed Km.hr$^{-1}$ |
|---|---|---|---|---|
| | 10 | 14 | 22 | |
| **2.681** | 6 | 4 | 3 | 4 |
| **3.563** | 5 | 3 | 3 | 3 |
| **LSD=0.05** | | | | 0.234 |
| **Means of tillage depth cm** | 6 | 4 | 3 | |
| **LSD=0.05** | | 1.098 | | |

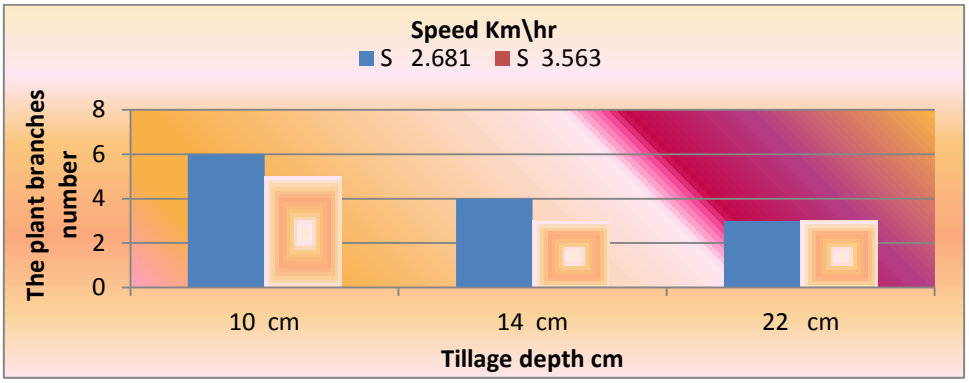


*Fig 6. The effect of practical speed and tillage depth on the plant branches number brach\plant*

**3.7.1000-grain weight**

The increase in tillage depth leads to decrease 1000-grain weight being 19.58, 18.76 and 17.70 g respectively for different levels of tillage depth. Decreased physical properties of soil when increasing the tillage depth and this is reflected negatively on 1000-grain weight. These results are consistent with the results of (Mutlak, 2018). From Table **7** .The speed of 2.861km.hr$^{-1}$ resulted in the highest 1000-grain weight (19.18 g) and at the speed of 3.563 km.hr$^{-1}$indicated the lowest 1000-grain weight (18.18 g). The interaction among plow moldboard , tillage depth 10cm and speed of 2.861km.hr-1 gave best result (20.16 g) . The level of the plant height at different conditions is show in Fig. **7** for speed and tillage depth .

**Table 7 The effect of practical speed and tillage depth on the 1000-grain weight g.**

| practical speed Km.hr$^{-1}$ | Tillage depth cm | | | Means of practical speed Km.hr$^{-1}$ |
|---|---|---|---|---|
| | 10 | 14 | 22 | |
| **2.681** | 20.16 | 19.21 | 18.19 | 19.18 |
| **3.563** | 19.01 | 18.32 | 17.20 | 18.18 |
| **LSD=0.05** | | | | 0.421 |
| **Means of tillage depth cm** | 19.58 | 18.76 | 17.70 | |
| **LSD=0.05** | | 1.081 | | |


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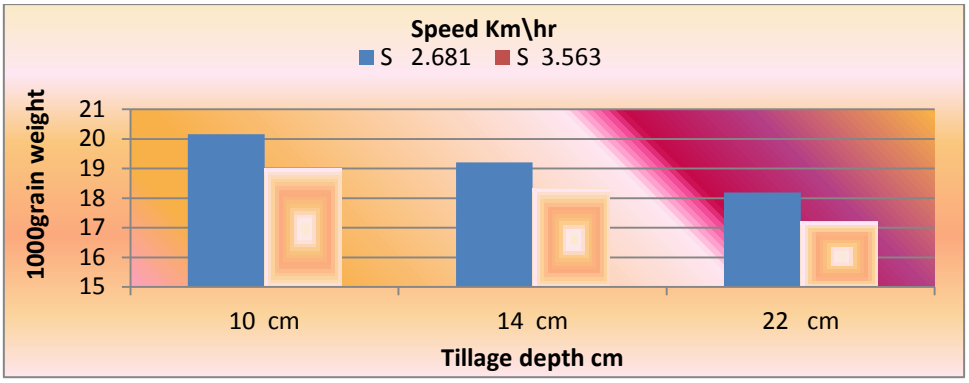


*Fig 7. The effect of practical speed and tillage depth on the 1000-grain weight g.*

### 3.8.Grain yield .

Table **8** shown the increase in tillage depth leads to decrease germination percentage being 3.273, 2.985 and 2.767 t.ha$^{-1}$ respectively for different levels of tillage depth. Because increasing tillage depth led to reduced the soil physical properties and reflected negatively on the grain yield for rice crop .These results are consistent with the results of (Mutlak, 2018) .The practical speed of 2.681 Km.hr$^{-1}$ resulted in the highest grain yield (3.200 t.ha-1) and at the practical speed of 3.563Km.hr$^{-1}$ indicated the lowest grain yield (2.817 t.ha$^{-1}$). The interaction among moldboard plow , tillage depth 10 cm and practical speed of 2.681Km.hr$^{-1}$ gave best result (3.525 t.ha$^{-1}$) . The level of the grain yield at different conditions is show in Fig. **8** for tillage depth and practical speed for tractor.

**Table 8 The effect of practical speed and tillage depth on the grain yield t.ha$^{-1}$**

| **practical speed Km.hr$^{-1}$** | **Tillage depth cm** | | | **Means of practical speed Km.hr$^{-1}$** |
|---|---|---|---|---|
| | 10 | 14 | 22 | |
| **2.681** | 3.525 | 3.091 | 2.985 | 3.200 |
| **3.563** | 3.021 | 2.880 | 2.550 | 2.817 |
| **LSD=0.05** | | | | 0.018 |
| **Means of tillage depth cm** | 3.273 | 2.985 | 2.767 | |
| **LSD=0.05** | | 0.121 | | |

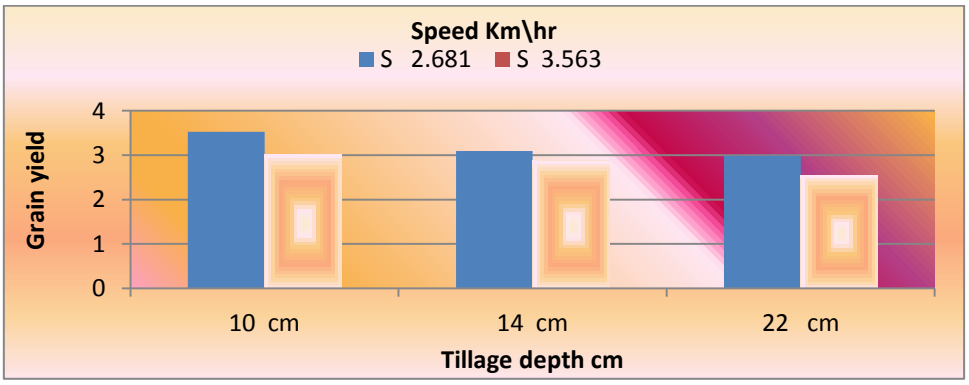


*Fig 8. The effect of practical speed and tillage depth on the* grain yield t.ha$^{-1}$

### 4.Conclusions

The practical speed 2.861 Km.hr$^{-1}$ is significantly better than the practical speed 3.563 Km.hr$^{-1}$ in all studied condition except fuel consumption and field efficiency and tillage depth 10cm was significantly superior to the other two tillage depth 14 and 22cm in


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all studied properties .The best results was obtained by moldboard plow at practical speed 2.681 Km.hr$^{-1}$ and 10 cm tillage depth.

## 5.Recommendations

The present recommends to carry out future studies using other of machinery types and other varieties of rice, or conduct other organizations on machine and the tillage depth to know their effect on the physical characteristics of soil.

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