Tikrit Journal for Agricultural Sciences (2020) 20 (1):10-19
https://doi.org/10.25130/tjas.20.1.2

IRAQI Academic Scientific Journals

ISSN:1813-1646 (Print); 2664-0597 (Online)
Tikrit Journal for Agricultural Sciences
Journal Homepage: http://tujas.tu.edu.iq
E-mail: tjas@tu.edu.iq

TJAS
Tikrit Journal for Agricultural Sciences

Design and Manufacture of Chisel Plow Shares and Their Effect on Some Field Performance Indicators

Basheer A. M. Al Nuaimi*;

Saad A. A. Al Rijabo[1]

1 *Agriculture Mechanization Dept. College. of Agric. & Forestry/ Mosul University /Iraq*

KEY WORDS:

chisel plow, moisture content, tillage depth, plow share, drawbar power indicators.

ARTICLE HISTORY:

Received: 15/05/2020

Accepted: 14/06/2020

Available online: 30/06/2020

ABSTRACT

The field experiment was carried out in one of the agricultural fields in Nineveh Governorate for the agricultural season (2019) in the soil texture was a silty loam to study the performance of locally manufactured chisel plow shares at two levels of soil moisture and depths of tillage, the research included studying soil moisture at two levels (13-15%) and (17-19%) and two depths of tillage are (12-14) cm and (15-17) cm and three types of shares are (conventional share, spearhead share and severed share) and there effect on some mechanical characteristics, including (drawbar power, percentage of slippage, fuel consumption) and volume of soil disturbed. The experiment was carried out according to the design of the randomized complete block design (RCBD) under (split-split block design) with three replication. The results of the statistical analysis showed the outperformed of the moisture content (13-15%) in obtaining the least drawbar power, the least slippage rate, fuel consumption and the highest soil disturbed volume, and outperformed the depth (12-14) cm in obtaining the least drawbar power, the least slippage rate and the least fuel consumption. While the depth outperformed (15-17) cm in obtaining the highest soil disturbed volume, and the severed share outperformed in obtaining the least drawbar power, the least slippage rate and the least fuel consumption, while the spearhead share outperformed in obtaining the highest soil disturbed volume, and achieved interaction The moisture content (13-15%) and depth (12-14) cm have the least drawbar power, slippage and fuel consumption, while achieving interaction between moisture content (13-15%) and depth (15-17) cm are the highest average soil disturbed volume, and the interaction between moisture content (13-15%), depth (12-14) cm and severed share has the least drawbar power and the least slippage and fuel consumption And achieved the moisture content (13-15%) and depth (15-17) cm with a spearhead share above the soil disturbed volume.

INTRODUCTION

The chisel plow is a kind of primary creeping soil formatting equipment. It works to penetrate the soil without turning it or changing its level or leaving large clods. It does not bury the remains of plants and bushes in addition to its speed in completing the tillage process. Thus reducing expenses as it maintains the soil moisture and not subjected it's to erosion especially in the sloping areas where there is a lot of rain. This feature makes it faster to work and more economical. At tillage it is preferable that the soil moisture be ideal in order to achieve the least specific resistance and adhesion to the soil with the smallest number of large clods of soil (Alrijabo and Sakhi, 1991). Reducing the

* *Corresponding author: E-mail*: bshyrahmd670@gmail.com

pulling force of the chisel plow is one of the tasks of designers and developers who demonstrate that by reducing the width of the surface of the share facing the soil surface from 70 mm to 40 mm it reduces the draft force by 24% (Chen and Bayron, 2002). However, an increase in the depth of tillage can lead to an increase in the draft force and may be accompanied by an increase in the drawbar power, slippage and fuel consumption due to the increase in the load on the plow, which increases the value of the resistance received by the plow and then increases the draft force and its power (Alrijabo and Al-Tai, 2013). The increase in the depth of tillage at an ideal moisture content from (10 to 17%) leads to an increase in the draft force from (0.7 to 1.1) kN due to the increase in the volume of clods when increasing the depth as well as the increase in the power resulting from adhesion, which requires greater draft force (Naderloo et al., 2009). Roudan, (2012) indicated that increasing the moisture content from (12 to 15 and then to 18%) leads to an increase in the percentage of slippage, that is, the relationship is usually direct, due to the decrease in the cohesion conditions between the wheels driving the tractor and the soil, thus increasing the slippage. Most farmers prefer the spear point share and the ducks foot share may be used under certain conditions. We note that locally manufactured shares do not reach great depths, so the process of modification and development is still ongoing by researchers in choosing a suitable type that reaches different depths (Alrijabo and Kashmola, 2013). Both Dahham, (2018) and Mamkagh, (2019) stated that the increase in moisture content and depth of tillage leads to an increase in the percentage of slippage due to the increase in the power required for pull with the increase in depth which works to delay the progress of the tillage and thus increases the slippage. Alrijabo and AL.Sheekh Ali, (2018) and Altalabani and Saad, (2018) concluded an increase in the moisture content under controlled conditions can lead to a decrease in the soil disturbed volume due to increased slippage and a decrease in the practical speed and consequently a decrease in practical productivity and since it is one of the compounds of the soil disturbed volume included in its calculation thus decreasing the value of the soil disturbed volume, as the increase in the tillage depth leads to an increase in the average soil disturbed volume due to the fact that the depth is a component of calculating the soil disturbed volume. Ghali, (2019) explained in his study on the effect of soil moisture and tillage depth on the fuel consumption of the chisel plow, it was found that there is an increase in fuel consumption when the moisture content and depth of tillage are increased due to the high soil resistance to the movement of the plow and the high load on the plow. The aim of this study was for the purpose of obtaining the best share manufactured for the chisel plow that perfectly penetrates the soil and achieves the best positive results for the mechanical characteristics of the ability requirements of the ability to drawbar power, the percentage of slippage, fuel consumption, the soil disturbed volume, and choose the most appropriate moisture content to work with these types of shares and their suitability to achieve the good results of the studied traits and know the best tillage depth achieved to work with these types of shares manufactured.

RESEARCH MATERIALS AND METHODS

The experiment was conducted in one of the agricultural fields in the village of Kharab / district of Wana, northwest of the city of Mosul, where the area of the field actually used (1) hectare and the field was planted with wheat in the season that preceded the season of the implementation of the experiment, knowing that the experiment field was irrigation and the soil texture was a silty loam, the randomized complete block design was followed and used the split-split block design method was used to conduct the experiment (Dawood and Elias,1990), where the main panels (Main Plot) were allocated to soil moisture at two level (13-15%) and (17-19%), and each main panel was divide in two secondary panel (sup plot) which was allocated to depth of tillage and at two level (12- 14) cm and (15-17) cm, and each secondary panel was divide into (sub sub plot) which was allocated to the type of share manufactured at three levels (conventional share and spearhead share and severed share) and using a fixed speed (4.72) km/h, Thus, the experiment will be (2 x 2 x 3), i.e. it contained (12) treatments and three replications, so that the number of experimental units (36) units with an area of (64.8) m^2 for the experimental unit with a length of (30) meters and a width of (2.16) meters. The Duncan multi-range test was used at the 0.05 probability level to test the significance of the differences between different treatment averages. The shares under investigation in the North

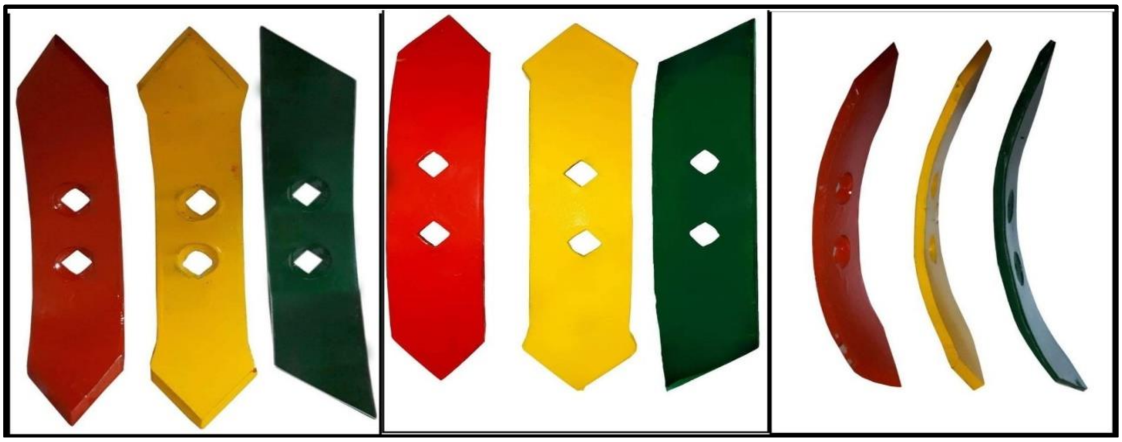
Company for Mechanical Industries / Mosul - Iraq were designed and manufactured for two types of shares. the first is the spearhead share and the second the severed share was used in the research in addition to the conventional share, and the mechanical properties of the metal were examined in the Material Inspection Laboratory/Mechanical Engineering Department/University of Mosul, was found to be within the permissible limits, and Table (1) shows the mechanical properties of the metal used in the manufacturing process, as table (2) shows the specifications of these shares and Figure (1) shows the front, back and side defoliant of these shares.

Table (1) shows the mechanical properties of the metal used

Specifications	**Conventional share**	**Spearhead share**	**Severed share**
Area of pointed limp of the share (mm^2)	900	1080	900
The thickness of the share (mm)	6	6	6
Share length (mm)	260	260	260
The separation angle	69.6º	79.6º	54.2º
The penetration angle	55.2º	50.2º	35.8º
Total share area (mm^2)	11200	11760	11200

Table (2) specifications of the shares used

Submission stress (N/mm^2)	**Tensile strength (N/mm^2)**	**Elongation ratio (%)**	**Hardness (HRC)**
1183.5	1411.9	9.37	31.14



Conventional share Spearhead share Severed share

Figure (1): The front, back and side defoliant of the shares

A New Holland TD95D tractor with a horse power of 98 hp was used with a chisel plow made by the State Company for Mechanical Industries/Aliskandaryah in Babel. The following indicators were studied:

1- The drawbar power (kw):

It is the measured power at the end of the uplifting arm or the hydraulic uplifting arms, and it also represents the power available to pull agricultural equipment, and the work rate exerted per unit of time, and the product multiplying draw force by forward speed, calculated by the following law (ASABE, 2006)

$$Pdb = \frac{D \times S}{3.6} \ldots \ldots (1)$$

where:

Pdb: is drawbar power required for the implement (kw).
D: is implement draft (kN).
S: is travel speed (km/h).

2- Slippage percentage (%):

It is the asymmetry between the length of the linear distance to the circumferential distance of a fixed number of wheel driving cycles in the tractor. Typically, the linear distance is relatively less than the circumferential distance, and was calculated according to the method used by (ASAE, 2003) and according to the following formula:

$$S = \left(Vt - \frac{Vp}{Vt}\right) \times 100 \quad \dots \dots (2)$$

where:
S: percentage of slippage (%).
Vt: theoretical speed (km/h).
Vp: Practical speed (km/h).

3- Fuel consumption (L/ha):

The fuel consumption was measured by the addition method, as a graduated cylinder was used to add fuel to the tractor's fuel tank after the completion of each transaction line and it was calculated according to the following law (AL-Hashem et al., 2000)

$$FC = \frac{Fca \times 10}{Wp \times Dp} \quad \dots \dots (3)$$

where:
FC: amount of fuel consumption per unit area (L/ha).
Fca: amount of fuel consumption during the process (ml).
Wp: actual tillage width (m).
Dp: length of distance (actual plowing line length in meter).

4- Volume of soil disturbed (m^3/hr):

It is the Volume of the soil raised by the plow during the tillage period, It depends on the practical productivity of the machine and the actual depth of tillage, and the raised soil volume can be calculated according to the following formula: (Ahaneku et al., 2010).

$$S.D.V = EFC \times DP \times 100 \quad \dots \dots (4)$$

where:
S.D.V: volume of soil disturbed (m^3/hr).
EFC: effective field capacity (ha/hr).
DP: actual plowing depth (cm).

RESULTS AND DISCUSSION

1- The drawbar power (kW): Table (3) shows the recording of moisture content (13-15%), the least significant value of the drawbar power reached (7.69) kw compared to the moisture content (17-19%), and the reason for that is because my qualities The draw force and draw-bar power complement each other, as any increase in one of them is directly reflected on the other, and this is what actually happened, as the increase in the draw force at the moisture content (17-19%) was followed by an increase in the drawbar power, and this is agree with what he mentioned (Hilal,2010 and Roudan,2012). The depth (12-14) cm achieved the least significant value of the drawbar power compared to the depth (15-17) cm, and the reason for this is that The draw force and drawbar power increases with increasing soil moisture content and soil cohesion, and the volume of soil raised is greatly increased when the depth increases, and this agree with what he mentioned (Aday et al., 2010, Alrijabo and Al-Tai,2013 and Bashir et al.,2015). It was also found that the severed share significantly outperformed on the conventional and spearhead shares in obtaining the least drawbar power at a rate of (7.92) kw compared to the remnant of the transactions, and the reason for the decrease in the drawbar power at the severed share is due to the decrease in the draw force due to the limited surface area of the share facing the soil with a decrease in depth Slightly, this, in turn, reflected positively on the ability to pull the plow, as the increase in the drawbar power of the spearhead share, is due to the fact that the share faces the soil more as a result of the increase in the area of the share section with the increase in depth, so the draw force and drawbar power increases, and these results are agree with the results obtained (Alrajabo and Kashmola, 2013). The table shows the outperformed of the moisture content interaction (13-15%) with the depth (12-14) cm significantly, in obtaining the least value of the drawbar power, which reached (6.81) kw compared to the remnant of the transactions. The moisture content (13-15%) with the severed share recorded the least value of the drawbar power of (6.65) kw compared to the remnant of the transactions. The interference between the depth (12-14) cm and the severed share recorded the least value of the drawbar power compared to the remnant of the transactions, and the reason is due to what was mentioned previously. It was found through the triple interaction between the moisture content (13-15%) with the depth (12-14) cm and the severed share obtained the least value of the drawbar power of (5.71) kw compared to the remnant of the transactions.

Table (3) Effect of the studied factors and their interference on characteristic drawbar power (kw)

Moisture content (%)	Depth of tillage (cm)	Share type			Interaction the moisture content with depth	
		Conventional	Spearhead	Severed		
13-15	12-14	7.09	7.62	5.71	6.81d	
	15-17	8.67	9.51	7.59	8.59 c	
17-19	12-14	9.01	9.96	7.98	8.98 b	
	15-17	11.58	12.18	10.42	11.39 a	
Interaction moisture content with the share type	13-15%	7.88	8.56	6.65	Average moisture content	7.69 b
	17-19%	10.29	11.07	9.20		10.19 a
Interaction depth with the share type	12-14	8.05	8.79	6.84	Average tillage depth	7.89 b
	15-17	10.12	10.85	9.00		9.99 a
Average share type		9.08 b	9.82 a	7.92 c		

The less value is the best

2- Slippage percentage (%): Table (4) shows the outperformed of moisture content (13-15%) by recording the least significant value of slippage at a rate of (10.94%) compared to moisture content (17-19%), and the reason for this is that Soil moisture has an effective and influential role in slippage, so the higher the soil's moisture, the increases the slippage, and this is due to the fact that the soil here is soft and has little coherence, and this increases the possibility of increasing the depth of tillage, as the conditions of cohesion between the wheels driving the tractor and the soil decrease between the wheels driving the tractor and the soil when increasing The moisture content thus increases the slippage the opposite is true, and this is agree with what he mentioned (Roudan,2012, Jebur and Alsayyah,2017 and Dahham, 2018). The depth (12-14) cm achieved the least significant slippage value compared to the depth (15-17) cm, and the reason for this is due to the increase in the required power for pulling with the increase in depth,and who works delaying the progress of the tillage vehicle and thus the increase in slippage, and this is agree with the results obtained (Taha,2011, Inchebron et al.,2012 and Mamkagh,2019). The severed share achieved the least significant slippage value and reached (11.89%) compared with the conventional and the spearhead shares, and the reason for this is that the severed share, which achieved the least force and power to draw as a result of less facing the soil when penetrating and with the least resistance and thus less slippage for the wheels, or the reason for the increase in the ratio Slippage at the spearhead share and it is due to the increase in the force and power of its drawing because of the resistance the plow receives result to the increase in the area of the share section, as mentioned previously, and these results are agree with what he mentioned (Alrijabo and Al-Tai, 2013). The interference between the moisture content (13-15%) with the depth (12-14) cm recorded the least value for the percentage of slippage compared with the remnant of the transaction, and the interference between the moisture content (13-15%) with the severed share recorded the least significant value of the slippage compared to the remnant of the transaction For the same reasons mentioned above. Depth (12-14) cm with the severed share recorded the least significant slippage value compared to the remnant of the transaction. Triple interference between moisture content (13-15%) with depth (12-14) cm and severed share recorded the least significant value for slippage percentage, while moisture content (17-19%) with depth (15-17) cm and share Spearhead has the highest slippage value.

Table (4) Effect of the studied factors and their interference on characteristic slippage of percentage (%)

Moisture content (%)	Depth of tillage (cm)	Share type			Interaction the moisture content with depth	
		Conventional	Spearhead	Severed		
13-15	12-14	9.53 j	10.16 i	7.77 k	9.15	
	15-17	12.43 g	13.91 e	11.86 h	12.73	
17-19	12-14	13.41 f	14.75 d	12.49 g	13.55	
	15-17	16.59 b	18.22 a	15.46 c	16.76	
Interaction moisture content with the share type	13-15%	10.98 e	12.04 d	9.81 f	Average moisture content	10.94 b
	17-19%	15.00 b	16.49 a	13.98 c		15.16 a
Interaction depth with the share type	12-14	11.47 e	12.46 d	10.13 f	Average tillage depth	11.35 b
	15-17	14.51 b	16.06 a	13.66 c		14.74 a
Average share type		12.99 b	14.26 a	11.89 c		

The less value is the best

3- Fuel Consumption L/ha: Table No. (5) shows the recording of moisture content (13-15%), the least significant value of fuel consumption was (13.53) L/ha compared to the moisture content (17-19%). The reason for this is due to the high soil resistance to the movement of the plow and the increase in clods and the sliding of the wheels at the high moisture content, The increase in the moisture content leads to an increase in the adhesion of the soil to the surface of the working part of the plow, and this in turn leads to an increase in the pulling force, and therefore this leads to increase the load on the tractor, and thus an increase in fuel consumption and this is agree with what he reached (Hilal,2010, Jebur and Alsayyah,2016 and Ghali,2019). The depth (12-14) cm recorded the least significant value of the fuel consumption compared to the depth (15-17) cm, and the reason for this may be that the increase in the depth increases the pulling force and the slippage that occurs to the wheels because increasing the depth requires more work (Stirring a larger amount of soil), and this is agree with the results obtained (Fahollahzade et al.,2010, Alrijabo and Al-Tai,2013, Tayel et al.,2015 and AL-Obaidi,2018). It was also found that the severed share significantly outperformed in obtaining the least value for fuel consumption compared with the conventional share and the spearhead share, and the reason for this is that the severed share is less confronting the soil, thereby reducing the pulling force and its ability, as well as reducing slippage and thus reducing fuel consumption, or increasing The fuel consumption of the spearhead share as we mentioned earlier result the increase in the area of the share clip. The moisture content (13-15%) outperformed the depth (12-14) cm significantly in obtaining the least value for fuel consumption compared with other factors. The moisture content (13-15%) with the severed share recorded the least value for fuel consumption, compared to the remnant of the transactions for the reasons mentioned above. Interference between depth (12-14) cm with the severed share showed the least significant value for fuel consumption compared to depth (15-17) cm and the spearhead share, which recorded the highest significant value for fuel consumption and recorded triple interference between the moisture content (13-15%) with Depth (12-14) cm and severed share have the least significant fuel consumption value compared with other transactions.

Table (5) the effect of the studied factors and their interference on characteristic fuel consumption (L/ha)

Moisture content (%)	Depth of tillage (cm)	Share type			Interaction the moisture content with depth	
		Conventional	Spearhead	Severed		
13-15	12-14	12.67 i	13.48 h	12.12 j	12.76 d	
	15-17	14.14 g	15.04 e	13.77 h	14.32 c	
17-19	12-14	14.67 f	15.40 d	14.60 f	14.89 b	
	15-17	17.65 b	18.70 a	16.83 c	17.73 a	
Interaction moisture content with the share type	13-15%	13.40	14.26	12.94	Average moisture content	13.53 b
	17-19%	16.16	17.05	15.71		16.31 a
Interaction depth with the share type	12-14	13.67 e	14.44 d	13.36 f	Average tillage depth	13.82 b
	15-17	15.89 b	16.87 a	15.30 c		16.02 a
Average share type		14.78 b	15.65 a	14.33 c		

The less value is the best

4- Volume of soil disturbed (m^3/hr): Table (6) shows the record of the moisture content (13-15%) The highest significant value of the raised soil volume was (994.49) m^3/hr compared with the moisture content (17-19%). The reason for this is due to the increase in the moisture content, which led to an increase in slippage and consequently the practical speed decreases, and this leads to a decrease in practical productivity, and since practical productivity is one of the compounds of the raised soil volume included in its calculation, so the volume of the raised soil decreases, and this is agree with what it reached (Alrijabo and AL.Sheekh Ali,2018). The depth (15-17) cm recorded the highest significant value of the raised soil volume and reached (1071.86) m^3/hr. The reason for this is due to the direct relationship between the average volume of the raised soil and the depth of tillage, as the increase the depth of tillage, this leads to an increase in the position of soil disturbance, thus increasing the volume of The raised soil, which is agree with his findings (Ashour,2016, Muhsin,2017, AL-Obaidi,2018 and Abdel Latif, et al.,2018). It was also found that the spearhead share was significantly outperformed on the conventional and severed share in obtaining the highest value for the volume of the raised soil. The reason is that the depth of tillage of the spearhead share was greater than the conventional and severed shares, which positively reflected on the volume of the raised soil because the relationship between the volume of the raised soil and depth direct relationship, as by increasing it the volume of the raised soil increases, and these results are agree with the results obtained (Jassim and Al-Shujairi,2011 and Alrajabo and Kashmola,2013). The interaction between the moisture content (13-15%) with the depth (15-17) cm resulted in obtaining the highest value of the raised soil volume compared to other factors and for the reasons mentioned above. The moisture content (13-15%) with the spearhead share, recorded the highest value of the raised soil volume compared with the remnant of the treatments for the same reasons mentioned previously. The interaction between the depth (15-17) cm with the spearhead share recorded the highest value of the raised soil volume compared with the remnant of the treatments. The triple interference between the moisture content (13-15%) with the depth (15-17) cm and the spearhead share recorded the highest value of the raised soil volume compared to the remnant of the treatments.

Table (6) Effect of studied factors and their interactions on characteristic of the Volume of soil disturbed (m^3/hr)

Moisture content (%)	Depth of tillage (cm)	Share type			Interaction the moisture content with depth	
		Conventional	Spearhead	Severed		
13-15	12-14	899.71	907.78	894.48	900.66	
	15-17	1089.27	1094.48	1081.20	1088.32	
17-19	12-14	875.57	879.60	863.84	873.00	
	15-17	1059.94	1056.45	1049.79	1055.39	
Interaction moisture content with the share type	13-15%	994.49	1001.13	987.84	Average moisture content	994.49 a
	17-19%	967.75	968.03	956.82		964.20 b
Interaction depth with the share type	12-14	887.64	893.69	879.16	Average tillage depth	886.83 b
	15-17	1074.60	1075.46	1065.49		1071.86 a
Average share type		981.12 a	984.58 a	972.33 b		

The higher value is the best

CONCLUSION:

We conclude from this study that the best combination of the performance of the machine unit was when using the moisture content (13-15%) with depth (12-14) cm and the severed share designed and manufactured locally, as the least drawbar power, the least slippage rate, and fuel consumption were obtained.

REFERENCES

Abdel Latif, Abdulrazzak, Alaa Salih Ati, Shaima Sami Dawood and Osama Hussein Gower (2018). The Effect of Speed and Tillage Depths on Some Machinery Units Performance Indicators, Growth and Yield of Corn (Zea mays L.) Using Fifth Purposes Combine Equipment, Iraqi Journal of Agricultural Sciences, Volume (18), No.(1).

Aday, Shaker H. , H. El-edan and J C. Al-maliky (2010). Further development of a modified chisel plow and studying: (A) The draft force and power requirements and the ability of soil pulverization (MWD) (part1). Basrah J. Agric. Sci, Vol.(23). No.(1).

Ahaneku, I. E. O. , A. Ouelade , and T. Faleye (2010). Comparative fild Evaluation of three model of atractor. Corresponding authors. E-mail:darha-neku@ yahoo.com.

AL-hashem, Hasan A. , Sirelkatim K. Abbouda and Mohamed O. Saeed (2000). The effect of Rear Wheel Track Width and Working depth on Performance of A2WD tractor. Res. Bult. No (93), Res. Cent. Coll. Of Agri., King Saud Univ, (5-21).

AL-Obaidi, Yahya Younis Mohsin (2018). Evaluation of heavy chisel plow performance in different speeds in terms of some mechanical performance indicators, M.Sc. Thesis, Department of

Agricultural Machinery and Equipment, College of Agriculture and Forestry, University of Mosul.

Alrijabo, Saad Abd al-Jabbar and Abd al-Hussain Ghanem Sakhi (1991). Agricultural equipment and machinery. Dar Al-Hekma for Printing and Publishing, University of Mosul, Ministry of Higher Education and Scientific Research.

Alrijabo, Saad Abdul Jabbar and Thanoon Younis AL.Sheekh Ali (2018) effect of added weights for agricultural tractor under two levels of moisture in some mechanical properties using the moldboard plow. Al-Rafidain Agriculture Journal Vol (46) No.(4).

Alrijabo, Saad Abdul Jabbar and Mahmoud Elias Ahmed Al-Tai (2013). Effect of tillage depths and blade shapes for chisel plow on tractor performance and some physical properties of soil, Kirkuk Journal of Agricultural Sciences, Volume (4) No.(2).

Alrijabo, Saad Abdul Jabbar and Sinan Bashar Younis Kashmola (2013). Design Effect of Shank Shape and the Developed Blade Type for Chisel Plow on Some of Power Requirement. Tikrit University Journal for Agricultural Sciences Vol (13) No.(2).

Altalabani, Jinan H.N. and Turki. M. Saad (2018). Effect of Soil Moisture and Tillage Depth on Some Machinery Properties using Disc Plow, Iraqi Journal of soil Sciences, Volume (18), No.(1).

ASABE, American Society of Agricultural and Biological Engineers (2006). EP496.3 Agricultural Machinery Management. ASAE Standards.

ASAE, Standard, (2003) Agricultural Machinery Data, D 497. 4 Feb 03, 372-380.

Ashour, Dheyaa Sabahi (2016). effect plow type, operating depth and speed on practical productivity, soil Volume distribution and pulverization, Dhi Qar Journal for Agricultural Research, Volume 5, No 2.

Bashir, M.A., M.I. Dawelbeit, M.O. Eltom, and H. Tanakamaru (2015). Performance Of Different Tillage Implements And Their Effects On Sorghum And Maize Grown In Gezira Vertisols, Sudan. International Journal Of Scientific & Technology Research, Volume 4, Issue04, April pp. 237-242.

Chen, ying and Byron Happer (2002). A liquid manure injection tool adapted to different soil and crop residue conditions. department of bio systems, Engineering, University of Manitoba, Winnipeg, MB Canada, paper No.02- 621.

Dahham, Ghazwan Ahmed (2018). Study effect of some field factors in determining the performance agricultural tractors, Rafidain Agriculture Journal, Volume (46), No.(4).

Dawood, Khaled Muhammad and Zaki Abd Elias (1990). Statistical methods for agricultural research, Dar Al-Kutub for printing and publishing, University of Mosul, Ministry of Higher Education and Scientific Research.

Fahollahzadeh, H., H. Mobli, A. Rajabipour, S. Minaee, A. Jafari, and S.M.H. Tabatabaie (2010). Average and instantaneous fuel consumption of Iranian conventional tractor with moldboard plow in tillage. ARPN Journal of Engineering and Applied Sciences, Vol. 5, No.2, pp. 3035.

Ghali, Aleawi.A. (2019). Effect of soil Moisture and Tillage Depth on some Mechanical Properties for Tillage Machines Type (Moldboard Plow). Journal of University of Babylon for Pure and Applied Sciences,vol. (27)), No.(2).

Hilal, Adnan Abd Ahmed (2010). studying the effect of machainery unit's weight on soil compacting three levels of speeds and two levels of moisture, Master Thesis, Department of Agricultural machinery and Equipment, College of Agriculture, University of Baghdad.

Inchebron, K., S.R. Mousavi Seyedi and R. Tabatabaekoloor (2012). Performance evaluation of a light tractor during plowing at different levels of depth and soil moisture content. International Research Journal of applied and Basic Sciences, 3(3) , 626-631.

Jassim, Abdul-Razzaq Abdul-Latif and Tahsin Allawi Al-Shujairi (2011). Influence of added weights on back tires, type of plow, depth of tillage, fuel consumption, volume of soil disturbed, and bulk density. The Fifth Scientific Conference of the Faculty of Agriculture - Tikrit University for the period from 26 to 27 April 2011, Department of Agricultural Machinery and Equipment, College of Agriculture, University of Baghdad.

Jebur, Hussain A. ,Yasir A. and A. Alsayyah (2016). the effect of soil moisture content on the energy requirement and fuel consumption of the machinery unit. International Journal of soil. Engine ering Sciences & Research Technology, 5(10), 261-266.

Jebur, Hussain A. and Yasir A. A. Alsayyah (2017). Study of the soil Moisture Content and the tractor Speed on the Performance Efficiency of the Machinery Unit. Journal of Agriculture and Veterinary Science, 10 (5) : pp. 65-70.

Mamkagh, Amer M. (2019). Effect of Soil Moisture, Tillage Speed, Depth, Ballast Weight and, Used Implement on Wheel Slippage of the Tractor: A Review. Asian Journal of Advances in Agricultural Research, 9(1): 1-7, 2019; Article no. AJAAR.46706 ISSN: 2456-8864.

Muhsin, Sadiq J (2017). Determination of Energy Requirements, Plowed Soil Volume Rate and Soil Pulverization Ratio of Chisel Plow Under Various Operating Conditions. Basrah J. Agric. Sci., 30(1): 73-84.

Naderloo, L., R. Alimadani, A. Akram, P. Javadikia and H. Zeinali Khanghah (2009). Tillage depth and forward speed effects on draft of three primary tillage implements in clay loam soil, Journal of Food, Agriculture & Environment, Vol.7 (3&4) : 382 - 385.

Roudan, Saif Ahmed (2012). The effect of soil moisture and tillage depth on some technical indicators of the performance of the mechanical unit when using a chisel plow, the second scientific conference of the College of Agriculture, University of Karbala.

Taha, Firas Juma (2011). performance of chisel plow under tillage depths and tractor speed, The Iraqi Agricultural Science Journal, 52 (5): 67-72.

Tayel, M.Y., S. M. Shaaban and H.A. Mansour (2015). Effect of plowing conditions on the tractor wheel slippage and fuel consumption in sandy soil. International Journal of ChemTech Research, 8(12), 151-159.

تصميم وتصنيع أسلحة المحراث الحفار وتأثيرها في بعض مؤشرات الأداء الحقلي

بشير احمد محمود النعيمي وسعد عبدالجبار اسمير الرجبو

قسم المكائن والآلات الزراعية / كلية الزراعة والغابات / جامعة الموصل / العراق

المستخلص

تم تنفيذ التجربة الحقلية في أحد الحقول الزراعية في محافظة نينوى للموسم الزراعي (2019) في تربة نسجتها مزيجة غرينية لدراسة أداء اسلحة المحراث الحفار المصنَّعة محلياً عند مستويين من رطوبة التربة واعماق الحراثة ، وتضمن البحث دراسة رطوبة التربة بمستويين هما (13-15%) و (17-19%) وعمقين للحراثة هما (12-14) سم و (15-17) سم وثلاثة أنواع من الاسلحة هما (السلاح التقليدي ، السلاح رأس الرمح والسلاح المقطوع) وتأثير ذلك في بعض الصفات المكننية ومنها (قدرة السحب ، النسبة المئوية للانزلاق ، استهلاك الوقود) وحجم التربة المثار . نفذت التجربة وفق تصميم القطاعات العشوائية الكاملة تحت نظام الالواح المنشقة – المنشقة وبثلاثة مكررات. بيّنت نتائج التحليل الاحصائي تفوّق المحتوى الرطوبي (13-15%) في حصوله على أقلّ قدرة سحب وأقلّ نسبة انزلاق واستهلاك وقود وأعلى حجم تربة مثار ، وتفوّق العمق (12-14) سم في حصوله على أقلّ قدرة سحب وأقلّ نسبة انزلاق وأقلّ استهلاك للوقود ، في حين تفوّق العمق (15-17) سم في حصوله على أعلى حجم تربة مثار ، وتفوّق السلاح المقطوع في حصوله على أقلّ قدرة سحب وأقلّ نسبة انزلاق وأقلّ استهلاك للوقود ، في حين تفوّق السلاح رأس الرمح في حصوله على أعلى حجم للتربة المثارة ، وحقّق التداخل بين المحتوى الرطوبي (13-15%) والعمق (12-14) سم أقلّ قدرة سحب ونسبة انزلاق واستهلاك وقود في حين حقّق التداخل بين المحتوى الرطوبي (13-15%) والعمق (15-17) سم أعلى معدل لحجم التربة المثارة ، وحقّق التداخل ما بين المحتوى الرطوبي (13-15%) والعمق (12-14) سم والسلاح المقطوع أقلّ قدرة سحب وأقلّ نسبة انزلاق واستهلاك للوقود ، كما حقّق المحتوى الرطوبي (13-15%) والعمق (15-17) سم مع السلاح رأس الرمح أعلى حجم تربة مثار .

الكلمات المفتاحية: المحراث الحفار، المحتوى الرطوبي، عمق الحراثة، سلاح المحراث، مؤشرات قدرة السحب