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# Effect Tiers Pressure and Speeds tractor on Performance Chisel and Disc Plows Ahmed Abd Ali Hamid Al-Mafrachi

Directorate of Dormitories, University of Baghdad, Baghdad, Iraq.

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## Introduction

Iraq is an agricultural country with total geographical area of 437072 km<sup>2</sup> (43.71 million Hectares or 108.0 million Acres or 174.84 million Donam Iraqi) Landward 432162 km² and Waters 4910 km<sup>2</sup>. The tillage operations, defined as mechanical manipulation of soil, are performed to achieve the desired seedbed to provide optimum environment for seed germination and plant growth. Increases in productivity in field operations can be accomplished in at least three ways: Increasing size and width of plow, Increasing tractor speeds, or combining operations to limit the number of trips across the field. Disc plough is used for primary tillage and is especially useful in hard and dry, stony or stumpy land conditions and in soil where scouring is a major problem, The disc angle ranges from 40° to 45° obtain the desired width of cut and the tilt angle ranges from 15° to 25° for penetration (Olatanji 2007 and Al-Danassory 2001). Chisel plow is used to till the soil but not turn it, It consists of a rectangular frame made of mild steel angle or channel section, heavy duty rigid tines made of mild steel flat or plate section, reversible shovels joined to tines with fasteners, and hitch assembly. The tines are mounted on the frame and distance between them can be varied (Al-Tahan 2000). Found Ali 2009 in experiment the slippage when used chisel plow was least from disc plow. Found Jasim and Juber 2012 effective field capacity for chisel plow was higher compare with disc plow. Increasing tires pressure result to increasing slippage, significant effects in effective field capacity, field efficiency and soil volume disturbed (Mohammed 2004, Al-Hadithy 2006). Founds Al-Hadithy & Al-Badri 2012, Taha 2011, Al-Jobory et al 2012 increasing slippage, Soil volume disturbed and effective field capacity with increasing speeds tractor. The aim of these field experiment is to compare effected the chisel and disc plows under variances tires inflation pressure and speeds tractor on measured Slippage, Effective field capacity, Field Efficiency, Soil Volume Disturbed and Specific Productivity Tillage. Material and Methods

## Field

Field experiment was conducted in Baghdad-Iraq in March 2015. The field was not agriculture and tilled since three years ago. Field was 31.7 m above sea level and the weather

Tele: E-mail addresses: ahmed.abd23@yahoo.com © 2015 Elixir All rights reserved

ABSTRACT

Field experiment conducted to measured Slippage, Effective field capacity, Field Efficiency, Soil Volume Disturbed and Specific Productivity Tillage in silt clay loam soil with depth 18 cm in Baghdad- Iraq. Split – split plot design under randomized complete block design with three replications using Least Significant Design 5 % was used. Three factor used in this experiment included Two types of plows included Chisel and Disk plows which represented main plot, Three Tires Inflation Pressure was second factor included 1.1, 1.8 and 2.7 Bar, and Three forward speeds of the tillage was third factor included 2.35, 4.25 and 6.50 km/hr. Result show chisel plow recorded best parameters performance.

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temperature was measured 28 C° and humidity was 36 %, Soil was silt clay loam (465, 423 and 112 g.kg-1 texture respectively). Depth tillage was 18 cm and Soil moisture was 17-19 % when soil tilled.

# **Experiment** Design

Split-Split plot design under randomized complete block design with Three replication using least significant design (LSD) 5 % was used to compare the mean of treatments. Statistical analysis system was used (Al-Sahookie 1990 and SAS 2010). Three factors were used in this experiment included Two types of plows included Chisel and Disk plows which represented main plot, Three Tires Inflation Pressure was second factor included 1.1, 1.8 and 2.7 Bar, and Three forward speeds of the tillage was third factor included 2.35 , 4.25 and 6.50 km/hr. Experiment included 18 treatments with three replication for each treatment  $(2 \times 3 \times 3 = 54 \text{ Treatments})$ .

**Tractor and Plows** 

Chisel and Disk Plows as represented main plot, mounted behind TUMOSON 95-80 Tractor and adjusted each of them at depth tillage 18 cm. The main specifications of the tractor, tires, Chisel and Disc Plows are listed in Table 1.Tractor working with full fuel tank and radiator. The tires used in this experiment was standard size for the tractor, as specified by the manufacturer. The tires walls was not damaged and the rear tires pressures was adjusted according to second factor in experiment included 1.1 ,1.8 and 2.7 bar . Three speeds tractor choosing carefully 2.35 , 4.25 and 6.50 km/hr by limited point start treatment length 30 m and must leftover 10 m at least before this distance 30 m to give the speed ground tractor stability in movement and operation tillage and determined time in second by stopwatch to cross the tractor these distance ( we calculated the time for 30 m only), then calculated by the following equation:

$$Vt = \frac{D}{T} \times 3.6$$
 (1)

When Vt was theoretical velocity measure in km / hr , D was distance treatment line tillage limited equal 30 m, T was time (in sec) to cross tractor distance 30 m , 3.6 was factor conversion. Operation tillage conducted with 2000 rpm engine tractor by put and control on lever fuel hand for all treatments in these experiment.

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Characteristics of agricultural tractor and tires						
Engine model	4DT-39T195					
No. of engine cylinders	4					
Diameter × Stroke (mm)	$104 \times 115$					
Cylinder Volume (Liter)	3.9					
Maximum Engine power(hp)	95					
Maximum Torque (Nm)	340					
Engine Rev.@ 540 r/m PTO rev.	2225					
Suspension Seat	2 Spring					
Gear Box	Mechanic 12 Forward - 12 Reverse					
Clutch Ty	12 Inch / Dry Type Single Disc					
Lifting Capacity (kg)	6000					
Tractor mass without ballast (kg)	3225					
Front tire (width – diameter, in)	7.50 - 18					
Rear tire (width – diameter, in)	18.4 - 30					
Fuel Tank Capacity (Liter)	115					
Characteristics of the Chisel plow						
No. of Tines	7					
Max. Working Width (m)	1.40					
Plough depth (m)	0.22					
Wight (kg)	300					
Made	Iraq					
Characteristics of the Disc plow						
No. of discs	3					
Plough depth (m)	0.30					
Width (m)	90					
Wight (kg)	380					
Made	Iraq					

## Table 1. Main specifications of the tractor, tires, and implements used in field experiment.

Table 2. Effect Type Plows, Tires Pressure and Tillage Speeds and interaction on Slippage %.

Treatments		Interaction	Plows, Tire Pres	ssure with Tillage Speeds	Interaction Types plows with Tire Pressure
Types	Tire Pressure	Tillage Spe	ed km/hr		
Plows	(bar)	2.35	4.25	6.50	
	1.1	3.08	5.91	9.27	6.09
Chisel	1.8	3.22	6.16	9.74	6.37
	2.7	3.62	6.55	10.12	6.76
	1.1	3.23	6.19	9.73	6.38
Disk	1.8	3.34	6.32	9.88	6.52
	2.7	3.75	6.59	10.36	6.90
Tillage	Speeds Mean	3.37	6.29	9.85	
Types Plows		Interaction Types plows with Tillage Speeds			Types Plows Mean
Chisel		3.31	6.21	9.71	6.41
Disk		3.44	6.37	9.99	6.60
Tire Pressure (bar)		Interaction Tires Pressure with Tillage Speeds			Tires Pressure Mean
1.1		3.15	6.05	9.50	6.23
1.8		3.28	6.24	9.81	6.44
2.7		3.68	6.57	10.24	6.83
L.S.D	0.05		•	•	•
Typesl	Plows: 0.0267	Tires P	ressure: 0.0327	Tillage Speeds : 0	.0327
ат .	·	· 1 m · D	NT C		

Interaction Types Plows with Tires Pressure : N.S

Interaction Types Plows with Tillage Speeds : 0.266

Interaction Tires Pressure with Tillage Speeds :0.1533

Interaction Types Plows, Tires Pressure with Tillage Speeds: 0.08

Effective Field Capacity ha/hr							
Treatments		Interaction Plows, Tire Pressure with Tillage Speeds			Interaction Types plows with Tire Pressure		
Types	Tire Pressure	Tillage Speed km/hr					
Plows	(bar)	2.35	4.25	6.50			
	1.1	0.2523	0.4455	0.6575	0.4517		
Chisel	1.8	0.2536	0.4439	0.6579	0.4518		
	2.7	0.2536	0.4425	0.6499	0.4478		
	1.1	0.1595	0.2815	0.4187	0.2866		
Disk	1.8	0.1608	0.2844	0.4149	0.2877		
	2.7	0.1582	0.3630	0.5361	0.2844		
Tillage Speeds Mean		0.2059	0.3630	0.5361			
Types Plows		Interaction Types	plows with Tillage	Types Plows Mean			
Chisel		0.2523	0.4439	0.6552	0.4504		
Disk		0.1595	0.2820	0.4172	0.2861		
Tire Pre	essure (bar)	Interaction Tires Pressure with Tillage Speeds		Tires Pressure Mean			
1.1		0.2059	0.3635	0.5381	0.3692		
1.8		0.2072	0.3641	0.5380	0.3698		
2.7		0.2046	0.3613	0.5324	0.3661		
L.S.D 0.05							
Types Plows : 0.0001Tires Pressure : 0.0002Tillage Speeds : 0.0002					ds : 0.0002		

Table 3. Effect Type Plows,	<b>Tires Pressure</b>	and Tillage Speeds	s and interaction o	n Effective Field	l Capacity	ha/hr
ective Field Capacity ha/hr						

Interaction Types Plows with Tires Pressure: 0.142

Interaction Types Plows with Tillage Speeds : 0.002

Interaction Tires Pressure with Tillage Speeds : 0.1139

Interaction Types Plows, Tires Pressure with Tillage Speeds: 0.0004

# Table 4. Effect Type Plows, Tires Pressure and Tillage Speeds and interaction on Field Efficiency %.

FieldEfficiency							
Treatments		Interaction Plows, Tire Pressure with Tillage Speeds			Interaction Types plows with Tire Pressure		
Types Tire Pressure		Tillage Spee	ed km/hr				
Plows	(bar)	2.35	4.25	6.50			
	1.1	76.70	74.87	72.24	74.60		
Chisel	1.8	77.10	74.60	72.30	74.66		
	2.7	76.28	74.36	71.41	74.02		
	1.1	75.42	73.61	71.57	73.53		
Disk	1.8	76.39	74.34	71.45	74.06		
	2.7	74.82	73.26	71.40	73.00		
Tillage	Speeds Mean	76.12	74.17	71.65			
Types Plows		Interaction Types plows with Tillage Speeds			Types Plows Mean		
Chisel		76.69	74.61	71.98	74.43		
Disk		75.12	73.74	71.65	73.53		
Tire Pro	essure (bar)	Interaction Tires Pressure with Tillage Speeds			Tires Pressure Mean		
1.1		76.06	74.24	71.91	74.07		
1.8		76.74	74.24	71.87	74.36		
2.7		75.55	73.81	71.17	73.51		
L.S.D	0.05				·		
Types Plows : 0.0909Tires Pressure : 0.1114Tillage			peeds : 0.1114				
Interact	tion Types Plows	with Tires Pres	sure N S				

Уŀ Interaction Types Plows with Tillage Speeds : 0.4437

Interaction Tires Pressure with Tillage Speeds : 0.6578

Interaction Types Plows, Tires Pressure with Tillage Speeds: 0.2728

Son volume Disturbed							
Treatments		Interaction Plows, Tire Pressure with Tillage Speeds			Interaction Types plows with Tire Pressure		
Types	Tire Pressure	Tillage Speed km/hr					
Plows	(bar)	2.35	4.25	6.50			
	1.1	428.6	757.0	1117.3	767.7		
Chisel	1.8	430.0	753.0	1118.0	767.2		
	2.7	426.3	752.0	1104.0	760.8		
	1.1	270.6	468.3	711.3	486.8		
Disk	1.8	273.0	483.0	710.0	488.7		
	2.7	267.6	475.3	705.0	482.7		
Tillage Speeds Mean		349.3	616.5	910.9			
Types Plows		Interaction Types plows with Tillage Speeds			Types Plows Mean		
Chisel		428.3	754.2	1113.1	765.2		
Disk		270	478.8	708.7	486.0		
Tire Pressure (bar)		Interaction Tires Pressure with Tillage Speeds			Tires Pressure Mean		
1.1		349.6	617.6	914.3	627.2		
1.8		351.5	618.3	914.0	627.9		
2.7		347.0	613.6	904.5	621.7		
L.S.D	0.05						

 Table 5. Effect Type Plows, Tires Pressure and Tillage Speeds and interaction on Soil Volume Disturbed

 Soil Volume Disturbed

Types Plows : 0.3219 Tires Pressure : 0.3943

Interaction Types Plows with Tires Pressure : 241.41

Interaction Types Plows with Tillage Speeds : 3.5521

Interaction Tires Pressure with Tillage Speeds : 193.62

Interaction Types Plows, Tires Pressure with Tillage Speeds: 0.9658

 Table 6. Effect Type Plows, Tires Pressure and Tillage Speeds and interaction on Soil Volume Disturbed.

 Specific Productivity Tillage

Tillage Speeds: 0.3943

Treatments		Interaction Plows, Tire Pressure with Tillage Speeds			Interaction Types plows with Tire Pressure		
Types	Tire Pressure	Tillage Speed km/hr					
Plows	(bar)	2.35	4.25	6.50			
	1.1	1823.6	3212.6	4707.3	3247.9		
Chisel	1.8	1815.6	3193.0	4699.3	3236.0		
	2.7	1818.3	3183.0	4674.6	3225.3		
	1.1	1833.3	3199.0	4704.6	3245.7		
Disk	1.8	1827.6	3195.0	4696.3	3239.7		
	2.7	1811.6	3195.5	4690.6			
Tillage Speeds Mean		1821.7	3194.5	4690.6			
Types Plows		Interaction Types	plows with Tillage	Types Plows Mean			
Chisel		1819.2	3196.2	4693.7	3236.4		
Disk		1824.2	3192.8	4687.5	3234.8		
Tire Pressure (bar)		Interaction Tires Pressure with Tillage Speeds			Tires Pressure Mean		
1.1		1828.5	3205.8	4706.0	3256.7		
1.8		1821.6	3194.0	4697.8	3237.8		
2.7		1815.0	3183.8	4668.1	3222.3		
L.S.D 0.05							
Types Plows : N . STires Pressure : 4.8856Tillage Speeds : 4.8856				eeds: 4.8856			
Interaction Types Plows with Tires Pressure : N. S							
Interaction Types Plows with Tillage Speeds : 13.405							
Interaction Tires Pressure with Tillage Speeds : 9.3271							

Interaction Types Plows, Tires Pressure with Tillage Speeds: 11.967

## Performance parameters

## Slippage %

Wheel slip is expressed as a percentage (i.e. how much travel distance has been reduced due to slippages). Wheel slip is one of the most important variables in assessing the efficiency of traction and correct operation of the machine. Slippage depend of many variable such as tractor weight or ballasts, type of implement, working depth, tire pressures, tillage speed and soil conditions (soil type, moisture, hardness, etc.) it can be calculated using the equation (Zoz and Grisso 2003):

$$S = \left(1 - \frac{Va}{Vt}\right) \times 100 \tag{2}$$

When S was slippage % and Va was actual velocity measure in km/hr .

#### **Effective Field Capacity**

Theoretical field capacity (TFC) is dependent only on the full operating width of the plow and the average travel speed in the field. It represents the maximum possible field capacity that can be obtained at the given field speed when the full operating width of the machine is being used. TFC calculated from equation:

$$TFC = 0.1 \times Va \times Wp \tag{3}$$

When, TFC was theoretical field capacity (ha/hr), 0.1 was factor conversion and Wp was working actual width plow in m.

Any operation tillage conduct found it Time lost such as turning, adjustment and change gear, etc. The effective field capacity was calculated by using the equation:

$$EFC = 0.1 \times Va \times Wp \times ft$$
 (4)  
When EEC was Effective Field Can

When EFC was Effective Field Capacity in ha/hr, and ft coefficient estimate time for primary tillage between (0.75 - 0.90) and we used 0.80 in these experiment (Roth et. Al 1977 and AL-Jubory et. al 2012).

## **Field Efficiency**

The Rate between Effective Field Capacity to Theoretical Field Capacity, it can be calculated using the equation:

$$FE = \frac{EFC}{TFC} \times 100 \tag{5}$$

When FE was Field Efficiency %.

#### Soil Volume Disturbed

The soil volume disturbed depend of effective field capacity and depth of tillage. It was calculated in cubic meters per hour calculated by multiplying the field capacity with the depth of tillage (cute) and 10000. It was calculated by using equation (Jasim 2004):

$$SVD = 10000 \times EFC \times Dt \tag{6}$$

When SVD was soil volume disturbed in cubic meters per hour,10000 was factor conversion and Dt was depth of tillage in meter.

## Specific Productivity Tillage

Calculated by divided Effective Field Capacity to working actual width plow, followed the equation:

soil, and these result agree with Ali 2009. Result show

significant effects in tires pressure in slippage, Increasing tires

$$SPT = \frac{10000 \times EPC}{Wp} \tag{7}$$

When SPT was Specific Productivity Tillage in m/hr.

# Result and Discussion Slippage

Table 2. Effect Type Plows, Tires Pressure and Tillage Speeds and interaction on Slippage %. Results show significant effects in the types of plows in percentage slippage %, Chisel plow recorded lower values 6.41% while disc plow recorded higher values 6.60 %, that may because of the difference in the weight plows, Figures and method of penetration plow in the pressure from 1.1 to 1.8 then to 2.7 bar result to increasing slippage from 6.23% to 6.44% then to 6.83% with increasing ratio (3.37 and 6.05% percent respectively), that may be because the cohesion between tires tractor and soil, increasing tires pressure result to fewer cohesion and lower contact between tires and surface soil. Result show significant effects in tillage speed in slippage, Increasing tillage speed from 2.35 to 4.25 then to 6.5 km/hr result to increasing slippage from 3.37 to 6.29 then to 9.85 % with increasing ratio (86.64 and 56.59% percent respectively), that may be because when increasing speed tractor reduce cohesion between tires and soil, these result agree with Al-Jobory et. al 2012. Interaction between types plows with Tire Pressure show no significant. Interaction between types plows with tillage speed show significant, Interaction chisel plow with speed 2.35 km/hr recorded lower slippage was 3.31%, While interaction Disc plow with speed 6.50 km/hr recorded higher slippage was 9.99 %. Interaction between tires pressure with tillage speed show significant, tire pressure 1.1 bar with speed 2.35 km/hr recorded lower slippage was 3.15%, While tire pressure 2.7 bar with speed 6.50 km/hr recorded higher slippage was 10.24 %. Interaction among types plows, tires pressure and tillage speed show significant, Chisel plow with 1.1 bar and 2.35 km/hr recorded lower slippage was 3.08 %, while disc plow with 2.7 bar and 6.50 km/hr recorded higher slippage was 10.3%.

#### **Effective Field Capacity**

Table 3. Effect Type Plows, Tires Pressure and Tillage Speeds and interaction on Effective Field Capacity . Results show significant effects in the type of plows, Chisel plow recorded higher value 0.4504 ha/hr while disc plow recorded lower value was 0.2862 ha/hr, that because chisel plow width was 1.40 m while disc plow was 0.90 m, these agree with Jasim and Juber 2012. Result show significant effects in tires pressure in Effective Field Capacity, Increasing tires pressure from 1.1 to 1.8 bar result to increasing from 0.3692 to 0.3698 ha/hr with increasing ratio (0.16%) and that because increasing tire pressure to level limited permissible result to increasing practical speed tractor then get to increasing Effective Field Capacity, while increasing tire pressure from 1.8 to 2.7 bar result to decreasing Effective Field Capacity from 0.3698 to 0.3661 ha/hr with decreasing ratio (1.0%). Result show significant effects in tillage speed in Effective Field Capacity, Increasing tillage speed from 2.35 to 4.25 then to 6.5 km/hr result to increasing Effective Field Capacity from 0.2059 to 0.3630 then to 0.5361 ha/hr with increasing ratio (76.29 and 47.68 % percent respectively) and that because speed tractor is the Main Factor calculate Effective Field Capacity, these result agree with AL-Jobory et. Al 2012 and Taha 2011. Interaction between types plows with Tire Pressure show significant, Interaction between chisel plow and tire pressure 1.8 bar recorded higher Effective Field Capacity was 0.4518 ha/hr, while interaction disc plow with tire pressure 2.7 bar recorded lower was 0.2844 ha/hr. Interaction between type plows with tillage speed show significant, Interaction chisel plow with speed 6.50 km/hr recorded higher Effective Field Capacity was 0.6551 ha/hr, While interaction Disc plow with speed 2.35 km/hr recorded lower was 0.1595 ha/hr. Interaction between tires pressure with tillage speed show significant, tire pressure 1.1 bar with speed 6.50 km/hr recorded higher Effective Field Capacity was 0.5381 ha/hr, While tire pressure 2.7 bar with speed 2.35 km/hr recorded lower was 0.2046 ha/hr. Interaction among types plows, tires pressure and tillage speed show significant, Chisel plow with 1.8 bar and 6.50 km/hr recorded higher Effective Field Capacity was 0.6579 ha/hr, while disc plow with 2.7 bar and 2.35 km/hr recorded lower was 0.1582 ha/he.

## Field Efficiency

Table 4. Effect Type Plows, Tires Pressure and Tillage Speeds and interaction on Field Efficiency .

Results show significant effects in the type of plows, Chisel plow recorded higher Field Efficiency was 74.43% while disc plow recorded lower was 73.53%, that may be because the difference between designer and practical width chisel and disc plow. Result show significant effects in tires pressure in Field Efficiency, Increasing tires pressure from 1.1 to 1.8 bar result to increasing from 74.07 % to 74.36 % ha/hr with increasing ratio (0.39 %) and that because increasing tire pressure to level limited permissible result to increasing practical speed tractor then get to increasing Field Efficiency, While increasing tire pressure from 1.8 to 2.7 bar decreasing field efficiency from 74.36 to 73.51% decreasing ratio (1.14%). Result show significant effects in tillage speed in Field Efficiency, Increasing tillage speed from 2.35 to 4.25 then to 6.5 km/hr result to decreasing field efficiency from 76.12 to 74.17 then to 71.65 %, with decreasing ratio (2.56 and 3.39 % percent respectively) and that because increasing tillage speed result to decreasing coefficient estimate time and that was clear when recorded the result in field during conduct the experiment field. Interaction between types plows with Tire Pressure show no significant. Interaction between types plows with tillage speed show significant, interaction between chisel plow and tillage speed 2.35 km/hr recorded higher field efficiency was 76.69 % while disc plow with speed 6.50 km/hr recorded lower value was 71.31 % . Interaction between tires pressure with tillage speed show significant, tire pressure 1.8 bar with speed 2.35 km/hr recorded higher field efficiency was 76.74 %, While tire pressure 2.7 bar with speed 6.50 km/hr recorded lower value was 71.17 %. Interaction among types plows, tires pressure and tillage speed show significant. Chisel plow with 1.8 bar and 2.35 km/hr recorded higher field efficiency was 77.10 %, while disc plow with 2.7 bar and 6.50 km/hr recorded lower field efficiency was 71.40 %.

# Soil Volume Disturbance

Table 5. Effect Type Plows, Tires Pressure and Tillage Speeds and interaction on Soil Volume Disturbed. Results show significant effects in the type of plows, Chisel plow recorded higher value was 765.2 m3/hr while disc plow recorded lower was 486 m3/hr, that because the difference between width for each plow, these result agree with Jasim 2004. Result show significant effects in tires pressure in soil volume disturbed, Increasing tires pressure from 1.1 to 1.8 bar result to increasing from 627.2 to 627.9 m3/hr ha/hr with increasing ratio (0.11 %), While increasing tire pressure from 1.8 to 2.7 bar decreasing soil volume disturbed from 627.9 to 621.7 m3/hr with decreasing ratio (1.08 %). Result show significant effects in tillage speed in soil volume disturbed. Increasing tillage speed from 2.35 to 4.25 then to 6.5 km/hr result to increasing soil volume disturbed from 349.3 to 616.5 then to 910.9 m3/hr, with increasing ratio (76.49 and 47.75 % percent respectively), that may be because increasing effective field capacity with increasing tillage speed, these result agree with AL-Jobory et. Al 2012 and Taha 2011. Interaction between types plows with Tire Pressure show significant, interaction between chisel plow with tire pressure 1.2 bar recorded higher value was 767.7 m3/hr, While disk plow with 2.7 bar recorded lower value was 482.7 m3/hr. Interaction between types plows with tillage speed show significant, interaction between chisel plow and tillage speed 6.50 km/hr recorded higher value was 1113.1 m3/hr, while disc plow with 2.35 km/hr recorded lower value was 270.4 m3/hr. Interaction between tires pressure with tillage speed show significant, tire

pressure 1.1 bar with speed 6.50 km/hr recorded higher value was 914.3 m/hr, While tire pressure 2.7 bar with speed 2.35 km/hr recorded lower value was 347 m/hr. Interaction among types plows, tires pressure and tillage speed show significant, Chisel plow with 1.8 bar and 6.50 km/hr recorded higher value was 1118 m3/hr, while disc plow with 2.7 bar and 2.35 km/hr recorded lower Soil Volume Disturbance was 2.67.6 m3/hr.

# Specific Productivity Tillage

Table 6. Effect Type Plows, Tires Pressure and Tillage Speeds and interaction on Soil Volume Disturbed. Results show No Significant effects in the type of plows in specific productivity tillage. Result show significant effects in tires pressure in specific productivity tillage, Increasing tires pressure from 1.1 to 1.8 then to 2.7 bar result to decreasing specific productivity tillage from 3246.7 to 3237.8 then to 3222.3 m/hr with decreasing ratio (0.27 and 0.47 % percent respectively). Result show significant effects in tillage speed in specific productivity tillage, Increasing tillage speed from 2.35 to 4.25 then to 6.5 km/hr result to increasing values from 1821.7 to 3194.5 then to 4690.6 m /hr, with increasing ratio (75.35 and 46.83 % percent respectively) and that because increasing tillage speed result to increasing effective field capacity. Interaction between types plows with Tire Pressure show No Significant. Interaction between types plows with tillage speed show significant, interaction chisel plow with 6.50 km/hr recorded higher value was 4693.2 m/hr, While chisel plow with 2.35 km/hr recorded lower value was 1819.2 m/hr. Interaction between tires pressure with tillage speed show significant, tire pressure 1.1 bar with speed 6.50 km/hr recorded higher value was 4706 m/hr, While tire pressure 2.7 bar with speed 2.35 km/hr recorded lower value was 1815 m/hr. Interaction among types plows, tires pressure and tillage speed show significant, Chisel plow with 1.1 bar and 6.50 km/hr recorded higher value was 4707.3 m/hr, while disc plow with 2.7 bar and 2.35 km/hr recorded lower value was 1811.6 m/hr.

# Conclusion

The best slippage, higher effective field capacity, Field efficiency and soil volume distributed were recorded when used Chisel plow, While higher slippage recorded when used disc plow. Effective field capacity, Field efficiency and Soil volume distributed were getting when used in Tire inflation pressure 1.8 bar, While less with 2.7 bar. Speed tillage 6.50 km/hr result to more effective field capacity, Soil volume distributed and Specific Productivity Tillage, While less with 2.35 km/hr. **Reference** 

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