Effects of Hardpan Marshland Soil and its Management on physical properties, water consumptive use and Barley growth (*Hordeum Vulgare* L.)

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Summary

An experiment was conducted on the Marsh land at the Al-Nasr irrigation project , Which is located at Al- Mudina district , Basrah province , south of Iraq . during winter season of 2007/2008, The soil Texture was silty clay.

The aim was to Study the effect of the impermeable layer on soil physical properties, water consumptive use and plant growth indicators . The research included surface tillage by moldboard plough with 25 cm depth, this did not reach to impermeable layer, and the subsurface tillage by Subsoiler Plough to depth 50 cm ,then with moldboard plough .The Soil was mixed with two levels of organic manure (0 and 1)% according to dry weight of soil to depth 30 cm .

The experiment was carried out in two soil, the first was cultivated and planted annually , whereas the second soil was abandoned for long time whithout Planting . After the soil had prepared , it was divided into experimental units , of (4 * 10) m. each the experimental treatments were distuributed into three replicates using the factorial complete randomized block design .

These two soil were planted with barley seeds (Hordeum Vulgare L.) in 21st of November 2007. The soil physical properties were determined for three depths (0-15) cm, (15-30) cm and (30-60) cm, and for four growth stages including Germination, branching (after 70 days), Flowering (after 120 days), and maturity (after 150 days).

The results could be summarized as the following :-

1. The existing of impermeable layer at 30 cm depth in both soil which planted (S_1) and non planted (S_0) caused an increase in the Soil bulk density(ρ_b) and penetration

resistance(PR) , whereas a decrease in the aggregate stability(MWD), total porosity(f) and saturated hydraulic conductivity(Ks) . The values of ρ_b and PR where higher in the S_0 compare with value of S_1.

2. Aggregate stability was increased due to the sub-soiler tillage in comparison with the surface tillage, with increasing value of 15.97% , The values were increased with the advance of growth stages and decreased with the increasing of Soil depth, the values were higher in the in the S_1 compare with value of S_0 .

3. In general , there was an increase in ρ_b &PR valuse and a decrease in f & Ks valuse with increase of soil depth. Breaking of the impermeable layer by subsoiler plough (C_2) resulted in an increase in soil porosity and saturated hydraulic conductivity, whereas the bulk density and soil penetration resistance were decreased in comparison with (C_1) treatment , these influences continuous until the end of growth season.

4. In spite of the reduction of ρ_b &PR values and increasing of f & Ks values for both tillage treatments C_1& C_2 in the beginning of growth season, but the ρ_b &PR were increase as the growth stages increase. The f & Ks values were decrease during the mature stage for both soil S_1& S_0 .

5.The addition of organic manure at 1%(OM_1) played an important role in improving soil physical properties, the values of MWD, f & Ks were increased and the values of ρ_b &PR were decreased in comparison with the OM_0treatment for both soil S_1& S_0.This increment in values were continued till the end of the season .

6. Existing of impermeable layer caused a reduction in values of ETa of the plant, values of ETa were 522.88, 512.21 mm season^{-1} for S_1& S_0 soil. and they increased to 627.98, 609.59 mm season^{-1} for S_1& S_0 , soil respectively, when impermeable layer was broken by using subsoiler plough. Also, the addition of organic manure at 1% rate caused an increasing in these values from 545.17, 529.62 mm . season^{-1}for

at OM_O treatment to 605.52, 592.06 mm season^{-1} at OM_1 treatment ,for S_1& S_0 soils respectively.

7. The sub- soiler tillage caused an increase in height and dry matter percentages of plants.Also an increase was recorded in the grains weight and consumptive water use efficiency (calculated on dry weight and grains weight bases) in comparison with Existing of impermeable layer for both soils S_1& S_0 . The S_1 gave high values in all parameters than S_0.

8.The results showed significant values for OM_1 treatment in comparison with OM_0 treatment in height of plants, dry matter and grains weight values . Also OM_1 treatment has significant values in WUE of dry matter weight and grains weight for both soils S_1 & S_0 . The S_1 Soil Showed the highest values.