

## **Influence of soil compaction and industrial wastes on yield and nutrient uptake by wheat and its residual effect on summer pearl millet grown in loamy sand soil**

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### **ABSTRACT**

A field experiment was conducted at Agronomy Instructional Farm, C. P. College of Agriculture, S. D. Agricultural University (erstwhile G.A.U.), Sardarkrushinagar during *rabi* and summer seasons of 2003 to study the "Influence of soil compaction and industrial wastes on yield and nutrients uptake by wheat-pearl millet crops grown in sequence in loamy sand soil". Total twenty one treatment combinations comprising of seven levels of soil compaction *viz.*, 1.50 (C<sub>0</sub>), 1.68 (C<sub>1</sub>) and 1.70 (C<sub>2</sub>) under dry condition; 1.80 (C<sub>3</sub>), 1.85 (C<sub>4</sub>), 1.75 (C<sub>5</sub>) and 1.83 (C<sub>6</sub>) Mg m<sup>-3</sup> bulk densities under wet condition and three levels of industrial wastes *viz.*, control (Iw<sub>0</sub>), ETP sludge (Iw<sub>1</sub>) and fly ash (Iw<sub>2</sub>) @ 10 t ha<sup>-1</sup> were tested in a split plot design with four replications. The results of the field investigation indicated that soil compaction treatments of C<sub>4</sub>/C<sub>6</sub> increased the grain and straw yield of wheat as well as subsidiary crop of pearl millet. The per cent increase in grain yield of wheat due to C<sub>4</sub> and C<sub>6</sub> levels was 21.3 and 24.3 per cent over control, respectively. Similarly, these treatments also showed residual effects on pearl millet productivity by 23.8 and 14.7 per cent higher over control, respectively. Soil compaction produced beneficial effects on growth and yield attributes of all the three crops. However, it was found significantly superior in obtaining higher plant height, total and effective number of tillers per plant of wheat and pearl millet and test weight of grain of both the crops. Higher levels of soil compaction (C<sub>4</sub>, C<sub>6</sub>, C<sub>5</sub> and C<sub>3</sub>) attained through 4 and/or 8 passes of iron roller at certain moisture content recorded higher content and uptake of nutrients (N, P, K, Ca, Mg, S, Fe, Mn, Zn, Cu) in grain and straw of wheat as well as succeeding crop of pearl millet. As regards the use of industrial wastes, it was observed that incorporation of ETP sludge (Iw<sub>1</sub>) significantly increased grain and straw yields both the two crops over by fly ash (Iw<sub>2</sub>) and control (Iw<sub>0</sub>). The per cent increase in grain yield of wheat and pearl millet due to ETP sludge was 10.1 and 10.9 and that of fly ash was to the tune of 7.8 and 8.0, respectively over control. Industrial wastes enhanced content and uptake of N, P, K, Ca, Mg, S, Fe, Mn, Zn and Cu by grain and straw of all the three crops. Generally, these followed the order ETP sludge > fly ash > control for removal of above ions.

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**Key words :** Soil compaction, ETP sludge, Fly ash, Wheat, Pearl millet, Loamy sand soil.

**I**n India, soil structure problems in different regions, are associated with texture, topography and rainfall; such as, high permeability and poor nutrient retention capacity is associated with sand and loamy sand textured soils, which reduces the water and fertilizer use efficiency. Generally, the productivity of the loamy sand soil is low due to coarse texture, inherent poor fertility, poor retention of water and nutrients. Sub-surface compaction perhaps improves the retention of water and nutrients (Agrawal 1991; Painuli *et al.*, 2000). Due to technological advancement, and enhanced industrial production, waste accumulation has increased considerably and its disposal has assumed serious dimensions not only in the western world but also in third world countries. Waste materials so released during various industrial processes contain some essential mineral nutrients and improve physical conditions of the soils, complementary use of these nutrients is of great important for sustainable soil productivity (Deshmukh,

2001). These industrial wastes have manurial and ameliorative effect on soil. In India, huge amount of (66 M cm/annum) industrial effluents are given out every year. The estimate showed that about 5 thousand tones of total N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O per every year are thrown away as industrial wastes and its economic value is of Rs. 22 millions (Deshmukh, 2001). This indicates that if solid wastes are used properly for agricultural purpose that can save a huge amount of nutrients. Looking into the constraints associated with highly permeable and low fertilized soils of North Gujarat, experiment was conducted during 2002-03 to evaluate any improvement in the yield of wheat through soil compaction and using ETP sludge and fly ash from soap industry and their residual effect on subsidizing crop of summer pearl millet.

### **MATERIALS AND METHODS**

Field experiment was conducted on loamy sand soil,