

# Effect of Heavymetal Containing Pesticides on The Geotechnical Properties of Agricultural Soil

Arya S Chandran

PG Student,

Department of CivilEngineering

Marian Engineering College Trivandrum, India

Revathy V S

Assistant Professor,

Department of Civil Engineering

Marian Engineering College Trivandrum, India

**Abstract**— Heavy metals at high concentration can cause soil pollution. Soil may become contaminated by the accumulation of heavy metals through the emission from industrial areas, application of fertilizers, pesticides etc. Now a days there is the need to increase the agricultural production, hence the use of pesticides and other chemicals. The addition of these cause change in the properties of soil and also leads to the contamination of the soil. Remediation is one of the most important method to remove the heavy metal traces in the soil. Several methods of remediation were done to reduce the concentration of contaminants. Hence this paper analyses the change occur on the geotechnical properties of soil due the addition of pesticides.

**Keywords**— Heavy metals, Low compressible clay soil,



Fig. 1 Agricultural soil

## I. INTRODUCTION

The soils become contaminated by the accumulation of heavy metals by the emission from land application of fertilizers, pesticides, and from industrial areas. Main heavy metals which affect the soil properties were mercury, zinc, arsenic etc. These affect the ordinary geotechnical properties of the soil and the properties get altered by the addition of pesticides in to the soil which affect the environment also.

Heavy metal contamination affect the soil system by the contact of surroundings with the soil , it affect through the food chain, through the contamination of water etc. The concentration of the heavy metals are high if it exposed into the atmosphere at low rate, the high concentration may causes severe problems in the soil. The direct exposure of the heavy metals into the soil at high concentration cause severe environmental problems in the soil surroundings.

Heavy metals are group of inorganic chemicals which may include arsenic, zinc, cadmium copper, nickel etc. The presence of these heavy metals in the soil affect the risk and hazards to the soil and then to the human beings.

### Materials Required

#### A. Agricultural soil

The agricultural soil were collected from Nedumangadu, Thiruvananthapuram district. The physical and the chemical properties of the soil were analysed. Fig1 shows the agricultural soil and the table 1 shows the properties of the soil.

Table 1 Properties of Agricultural Soil

Sl.No.	PROPERTY	VALUE
1.	Initial moisture content (%)	12.5
2.	Specific Gravity, G	2.59
3.	Liquid Limit (%)	45.4
4.	Plastic Limit (%)	21.60
5.	Plasticity Index (%)	23.80
6.	Optimum Moisture Content (%)	20.1
7.	Max. Dry Density (g/cc)	1.72

#### B. Heavy metal containing Pesticide

The heavy metal containing pesticide is obtained from Krishimithra, Thiruvananthapuram. The properties of the pesticides were given in the table 2.

Table2. Properties of Heavy metal containgi pesticide

Sl. No.	PROPERTY	pesticides
1.	colour	black
2.	form	liquid

II. EXPERIMENTAL PROGRAMME

The studies were conducted to determine the geotechnical property variation of soil with the addition of heavy metal containing pesticide in the soil. For this the pesticide were added at different percentage into the soil and the variation in liquid limit, plastic limit, plasticity index, specific gravity, unconfined compressive strength etc were studied. The studies were conducted as per IS2720.

III. RESULTS AND DISCUSSIONS

A. Variation in specific gravity

The heavy metal containing pesticide added at varying percentage to the soil such as 0%, 2%, 4%, 6% etc, and the variation is plotted. The specific gravity increased at a small rate by the addition of pesticide.

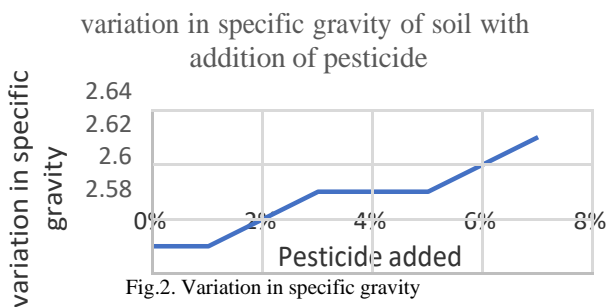


Fig.2. Variation in specific gravity

B. Variation in Liquid Limit

The varying percentage of pesticide is added to the soil and the variation in liquid limit plastic limit and the plasticity index are concluded.

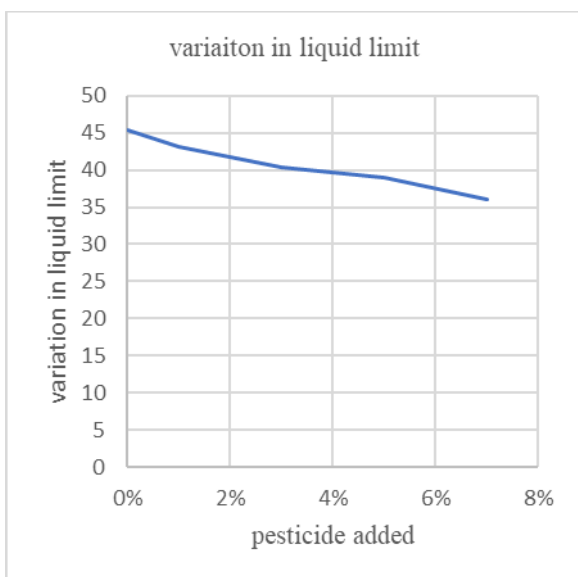


Fig.3. variation in Liquid Limit

C. Variaiton in Plastic Limit

By the addition of pesticide at varying percentage in the soil for the determination o plastic limit variation shows a decreasing trend in the plastic limit.

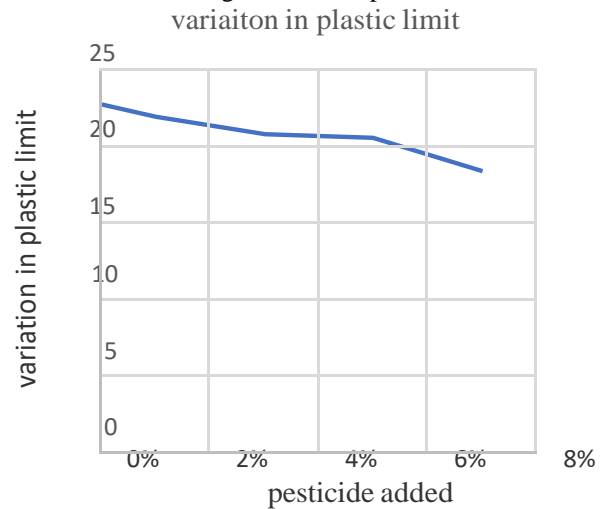


Fig.4. Variation in plastic limit

IV CONCLUSION

From the study, the following conclusions were obtained:

- The addition of heavy metal containing pesticide change the geotechnical properties of the soil
- The specific gravity shows an increasing trend with the addition of pesticide.
- The specific gravity varies from 2.59 to 2.71.
- The liquid limit of the soil shows a decreasing trend, it varies from 45.4 to 36 by the addition of small amount of pesticide.
- The plastic limit also shows a decreasing trend.

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