WHICH MATERIAL WOULD RETAIN WATER THE MOST?

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Submitted by

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ARRAHMAAN
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(Creating the community of Excellence)

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ABSTRACT

Nowadays most of the agricultural land faces a critical water shortage, with its poor retention soil endangering the regional eco-environment. In my research I investigated the effects of different organic mulching material on water retention in two different soils (Loamy soil and Silt soil). Organic mulching materials which are the organic waste will able to retain the water in the soil and it improves the fertility of the soil. Therefore the chemical fertilizer and artificial mulching in agriculture will affects the nature of the soil and that will be toxic to the plants which are grow in the soil. Mulching materials are also used to control weed in agricultural field and it reduces the pest which affect the plants.

This science fair project was conducted to find out the amount of water retained by different types of organic mulching materials in two different soils. This project was performed using **Coco Peat, Paddy Straw, Powdered Saw Dust, Saw Dust** and **Husk** as the organic mulching materials to retain the water. I selected two different types of soil, one is garden soil which will retain the water well and another one is silt soil which is poor retention soil. I selected these two types of soil because I want to study the effect of mulching materials both in good retention soil and poor retention soil.

I mixed 1kg of soil with 100g of fertilizer and placed into the each tray. I varied the amount of organic mulching materials (Coco peat, paddy straw, powdered saw dust, saw dust and husk) used in the tray to determine which amount will retain the water more. Mulching materials were mixed at different amount of weight 50g, 100g, and 150g to the soil. I mixed all the materials evenly in the tray for better aeration. I selected *Pennisetum glaucum* seed for plantation in this project because it will use less amount water and it is useful for my project to calculate the exact amount of water retention by the mulching materials which were mixed with the soil. I had sown 20g of germinated *Pennisetum glaucum* seed for all the trays. For analyzing the water retention I planned to place the tray with hole in the center point of the tray and its ends with pipe to drain the excess water from the tray. I placed the tray in slightly slanting position to avoid water logging in the tray.

I found coco peat and paddy straw retain more water among all the mulching materials and it also act as the fertilizer to raise the plant growth.

- ***Coco Peats' 100g retain the water most in garden soil and Coco Peat 150g retains the water most in silt soil.***

INTRODUCTION

Soil water shortage is often a key factor that limits crop production and agricultural development in desert. This factor constrains the selection and restoration of regional native vegetation, while it also determines soil productivity. To solve the problem of soil water shortage in sandy lands, it is critical to improve soil infiltration and water retention capacity.

Water Retention

Soil water retention is essential to life. It provides an ongoing supply of water to plants between periods of replenishment (infiltration), so as to allow their continued growth and survival.

Soil water retention capacity, hydraulic conductivity, and permeability are primarily determined by texture (sand, silt, clay contents), structure (bulk density and porosity), and organic matter content.

Soil Water (Retention)

Soils can process and hold considerable amount of **water**. They can take in water, and will keep doing so until they are full, or until the rate at which they can transmit water into and through the pores is exceeded. Some of this water will steadily drain through the soil (via gravity) and end up in the waterways and streams, but much of it will be **retained**, despite the influence of gravity. Much of this retained water can be used by plants and other organisms, thus contributing to land productivity and soil health.

Pores (the spaces that exist between soil particles) provide for the passage and/or retention of gasses and moisture within the soil profile. The soil's ability to retain water is strongly related to particle size; water molecules hold more tightly to the fine particles of a clay soil than to coarser particles of a sandy soil, so clays generally retain more water.[1] Conversely, sands provide easier passage or transmission of water through the profile. Clay type, organic content, and soil structure also influence soil water retention.

The maximum amount of water that a given soil can retain is called field capacity, whereas a soil so dry that plants cannot liberate the remaining moisture from the soil particles is said to be at wilting point. Available water is that which the plants can utilize from the soil within the range between field capacity and wilting point. Roughly speaking for agriculture (top layer soil), soil is 25% water, 25% air, 45% mineral, 5% other; water varies widely from about 1% to 90% due to several retention and drainage properties of a given soil.

The role of soil water retention is profound; its effects are far reaching and relationships are invariably complex. This section focuses on a few key roles and recognizes that it is beyond the scope of this discussion to

encompass all roles that can be found in the literature. The process by which soil absorbs water and water drains downwards is called percolation.

Soil water retention and organism

Soil water retention is essential to life. It provides an ongoing supply of water to plants between periods of replenishment (infiltration), so as to allow their continued growth and survival. For example, over much of temperate Victoria, Australia, this effect is seasonal and even inter-annual; the retained soil water that has accumulated in preceding wet winters permits survival of most perennial plants over typically dry summers when monthly evaporation exceeds rainfall. Soils generally contain more nutrients, moisture, and humus.

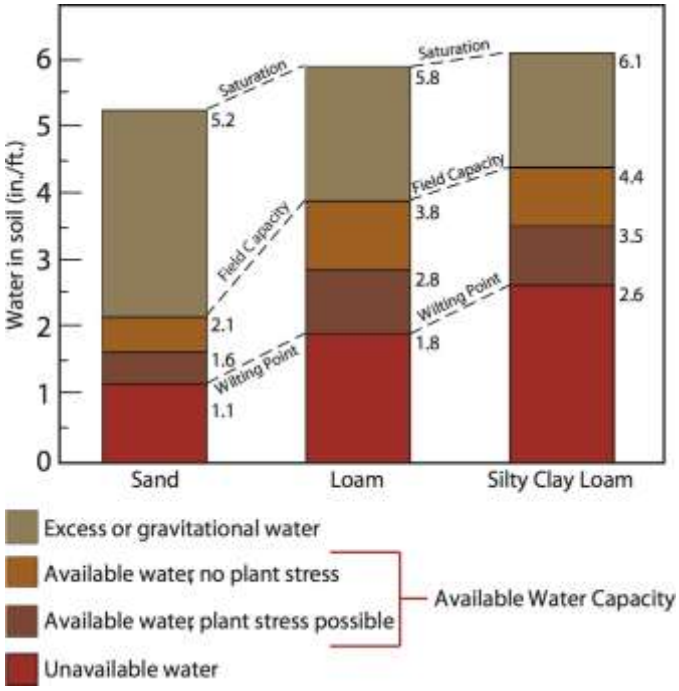
Soil water retention and climate

Soil moisture has an effect on the thermal properties of a soil profile, including conductance and heat capacity.[3] The association of soil moisture and soil thermal properties has a significant effect on temperature-related biological triggers, including seed germination, flowering, and faunal activity. (More water causes soil to more slowly gain or lose temperature given equal heating; water has roughly double the Heat capacity of soil)

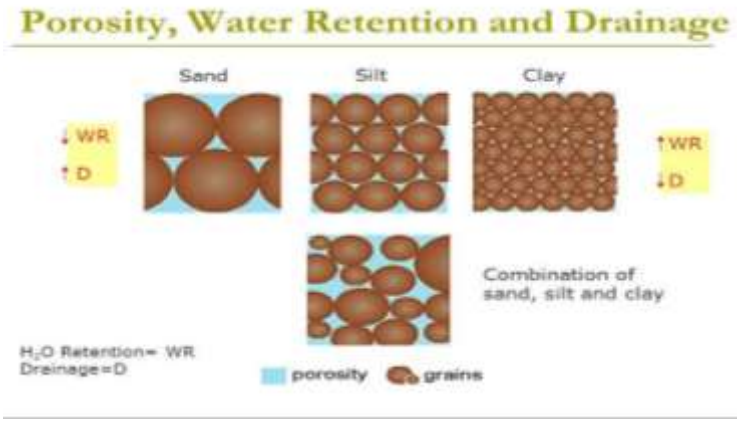
Why is water retention in soil important?

- **Soil Water Retention** is key to farming productivity.
- Employing **soil** that is able to hold a high amount of moisture can help you reduce the negative effects of droughts, floods, erosion, and degradation while also improving the quantity and quality of your crop yield.
- Water-holding capacity is controlled primarily by soil texture and organic matter. Soils with smaller particles (silt and clay) have a larger surface area than those with larger sand particles, and a large surface area allows a soil to hold more water. In other words, a soil with a high percentage of silt and clay particles, which describes fine soil, has a higher water-holding capacity. The table illustrates water-holding-capacity differences as influenced by texture. Organic matter percentage also influences water-holding capacity. As the percentage increases, the water-holding capacity increases because of the affinity organic matter has for water.

Available Water Capacity by Soil Texture	
Textural Class	Available Water Capacity (Inches/Foot of Depth)
Coarse sand	0.25–0.75
Fine sand	0.75–1.00
Loamy sand	1.10–1.20
Sandy loam	1.25–1.40
Fine sandy loam	1.50–2.00
Silt loam	2.00–2.50
Silty clay loam	1.80–2.00
Silty clay	1.50–1.70
Clay	1.20–1.50

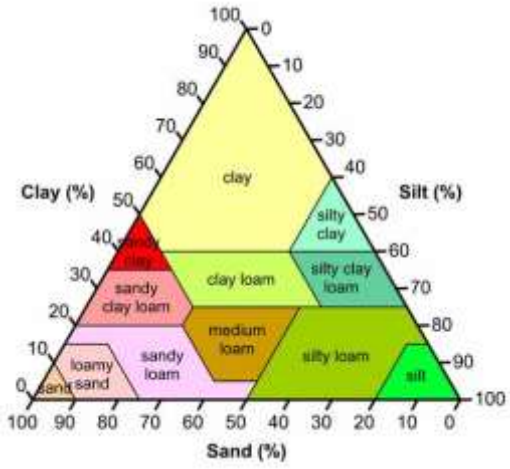


Soil is a valuable resource that supports plant life, and water is an essential component of this system. Management decisions concerning types of crops to plant, plant populations, irrigation scheduling, and the amount of nitrogen fertilizer to apply depend on the amount of moisture that is available to the crop throughout the growing season. By understanding some physical characteristics of the soil, you can better define the strengths and weaknesses of different soil types.



Which soil absorbs the most water?

Silt soil absorbs very little water because its particles are relatively large. The other components of soils such as clay, sand and organic matter are much smaller and absorb much more water. Increasing the amount of silt in the soil reduces the amount of water that can be absorbed and retained. Garden soil is typically very absorbent, this is due to its high organic matter content and very little sand.



MATERIALS USED TO INCREASE THE WATER RETENTIO IN SOIL

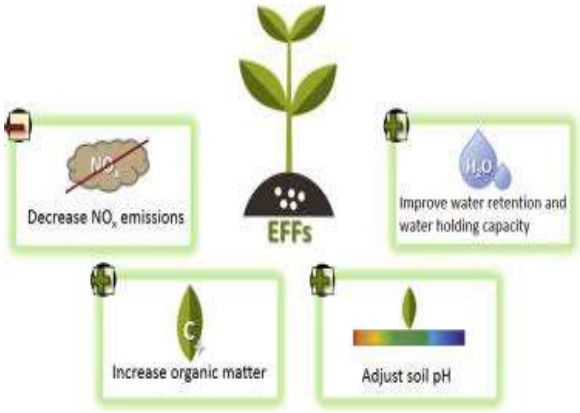
What is Mulch?

Mulch is "a layer of material applied to the surface of an area of soil. Its purpose is any or all of the following: to conserve moisture; to improve the fertility and health of the soil; to reduce weed growth; and/or to enhance the visual appeal of the area."

Mulch can come in a variety of different shapes and sizes. Many organic and non-organic materials can be used to make mulch.

Mulch is a layer of material applied to the surface of an area of soil. Its purpose is any or all of the following:

- To conserve moisture
- To improve the fertility and health of the soil
- To reduce weed growth
- To enhance the visual appeal of the area



Mulching as NWRM is using organic material (e.g. bark, wood chips, grape pulp, shell nuts, green waste, leftover crops, compost, manure, straw, dry grass, leaves etc.) to cover the surface of the soil. It may be applied to bare soil, or around existing plants. Mulches of manure or compost will be incorporated naturally into the soil by the activity of worms and other organisms. The process is used both in commercial crop production and in gardening, and when applied correctly can dramatically improve the capacity of soil to store water.

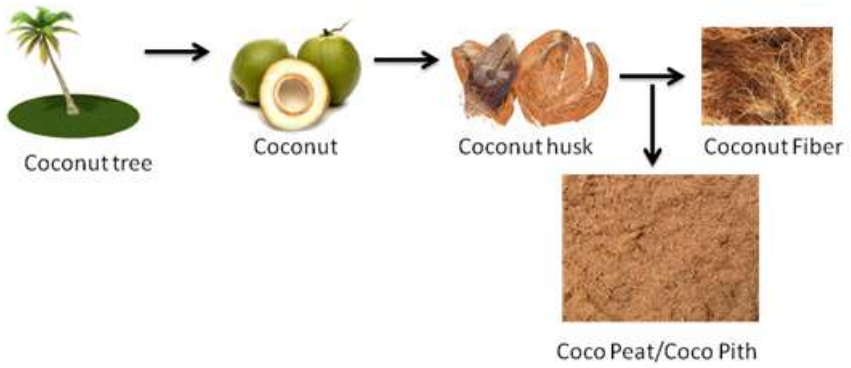
DIFFERENT MULCHING MATERIALS:

Coco peat:

Cocopeat is a natural fibre made out of coconut husks. The extraction of the coconut fibre from husks gives us this by-product called cocopeat.

The eco-friendly material Cocopeat is a 100% natural growing medium. Cocopeat is dried under natural sunlight, and processed to produce various growing mechanisms. Cocopeat has a highly porous material structure. Hence Cocopeat can absorb large volumes of water. Generally Cocopeat can absorb water about half of its volume and 5 to 6 times its weight. Cocopeat has great oxygenation properties. That makes Cocopeat rooting solutions highly suitable for potting mixtures.

Coco peat has a **carbon-nitrogen (C/N)** ratio of 104:1. Coco peat can store and release nutrients to plants for long periods of time. pH value of Coco peat ranges between 5.2 and 6.8 which is neutral to slightly acidic.



Paddy straw:

Rice straw helps reduce weeds and increase soil moisture when used on its own or as a base layer for mulch. Rice straw is lightweight, so it is best used in a place that will not get heavy winds when used without heavier mulch as a top layer. Soil that lacks nitrogen can cause problems for many plants and trees. A layer of straw mulch inhibits weed growth.

Saw dust:

Sawdust is a waste from the wood and timber industry. Wood chip mulches can actually pull nitrogen from the soil and should be used with care. The main chemical components of sawdust are carbon (60.8%), hydrogen (5.2%), oxygen (33.8%), and nitrogen (0.9%). Dry wood is primarily composed of cellulose, lignin, hemicelluloses, and minor amounts (5–10%) of extraneous materials. Sawdust is acidic, making it a good mulch choice for acid-loving plants.

Husk

Rice husk is an organic waste and is produced in large quantities. It is a major by-product of the rice milling and agro-based biomass industry. It contains approximately 40% cellulose, 30% lignin group, and 20% silica. Rice husk can absorb water ranging from 5% to 16% of unit weights. The materials often used as organic mulch is rice husk. In addition to reduce the waste of rice plants, rice husks are spread over the surface of the soil can also function as mulch. It is expected that the use of organic mulch can optimize the growth of plants so as to increase yields.

STATEMENT OF THE PROBLEM

The water scarcity is mainly man made due to excess population growth and mismanagement of water resources. Some of the major reasons for water scarcity are inefficient use of water for agriculture. India is among the top growers of agricultural produce in the world and agriculture is the backbone of India, therefore the consumption of water for irrigation is amongst the highest. Traditional techniques of irrigation cause maximum water loss due to evaporation, drainage, percolation, water conveyance, and excess use of groundwater. I used organic waste as the mulching material to analyses the effect of organic mulching material in retaining the water in the soil which are used as the growing medium.

HYPOTHESIS

Coco Peat Retain Water Best in Garden soil.

DESIGN OF STUDY

INDEPENDENT VARIABLE:

- Types of mulching materials

DEPENDENT VARIABLE:

- Rate of water retention

CONTROLLED VARIABLES:

- Type of soil
- Quantity of mulching materials
- Weight of the soil
- Type of seed (*Pennisetumglaucum)*
- Weight of the seed
- Size of the container and collecting can
- Amount of water (poured)
- Time period for testing

MATERIALS:

- Coco Peat
- Husk
- Powdered Saw Dust
- Saw Dust
- Paddy Straw.
- Garden soil
- Silt soil
- Manure
- Cardboard
- Measuring cups
- Measuring cylinder
- Seed (*Pennisetumglaucum)*
- Cotton cloth
- Welding machine
- Water bottle
- Funnel
- Collotype
- Measuring scale
- Digital weighting machine
- Beaker
- Gum
- Tray
- PVC pipe
- Marker
- Labels
- Thread

PROCEDURE:

- **Preparing container:**
  - Prepare 32 identical plastic trays, make hole in the centre of the tray with welding machine (with proper measurement).
  - Cut 7cm of PVC pipe and fix it in the hole of the tray & make over with glue. (Allow them to dry).
- **Collection of soil:**
  - Collect two types of soil, Garden soil and Silt soil.
- **Removable of waste & weeds in soil:**
  - Remove weeds & waste organic materials from the soil.
- **Labeling:**
  - Label the tray and collecting water can, according to the respective material.
- **Measuring of soil:**
  - Measure 1KG of soil in digital weight machine and transfer into the respective labeled tray.
- **Preparation of mulching materials:**
  - COIR PEAT: Measure coir peat (50,100,150g) & add with the soil in the tray.mix it well.
  - SAW DUST: Measure two type of saw dust (powder saw dust and solid saw dust) in various concentrations. And mix it with the soil (50,100,150g in both sawdust).
  - PADDY STRAW: Cut the straw into small pieces and soak it in water for (2hr) and then drain all 7water & measure the straw as 50g, 100g, and 150g & add the straw with the soil and make over it well.
  - HUSK: Measure 50g, 100g, and 150g of husk and mix it well with soil.
- **Fertilizer or manure:**
  - Add 100g of manure for each tray.(ratio 10:1)
- **Seed quality test:**
  - Soak pearl millet in water for 5hr & then remove the unhealthy seeds by visual examination.
  - Drain all the water and tie the millets in cotton cloth for germination, allow them to germination for 24hrs.
- **Sowing of seeds:**
  - Seeds are sown in equal manner in the tray and cover that seed with fine soil. 20g of seeds will be sown in each tray.
  - Make sure to plant them tightly & press down firmly to compact the soil.

- **Experiment set up:**
  - Fix all trays at slanting position in the same order and place the collecting water can with funnel on the tip of the PVC pipe in the tray.
- **Irrigation:**
  - Slowly pour equal amounts of water into each of the tray.
  - Use measuring cup to pour water.
  - Excess amount of water will be collected in the can through the hole with pipe connection.
- **Control:**
  - Add 1KG of soil & 100g of manure and mix it well.(both soil in separate tray).
  - Sow the seeds and don't add any organic mulching material in control.

COLLECTION OF DATA- PHOTOGRAPHS


SOAKING SEEDS


ADDING MANURE


PREPARING COLLECTING CAN

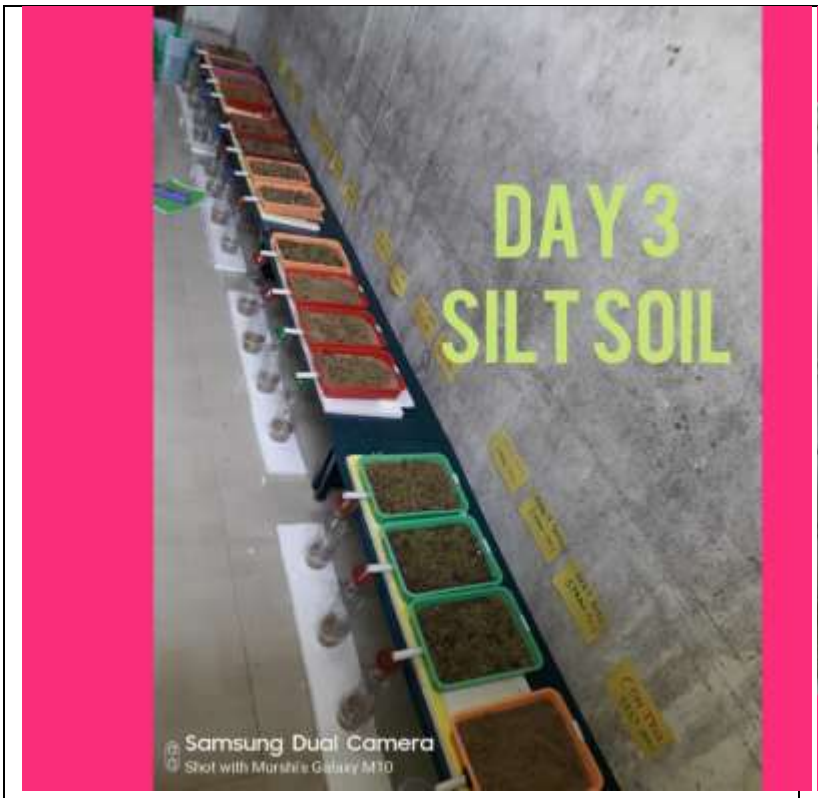

GERMINATED SEEDS


SETTING UP TRAY IN SLANTING POSITION


SOWING OF SEEDS


SOAKING NEEM CAKE SEEDS
ng Dual Camera
ng Dual Camera


IRRIGATION
Samsung Dual Camera


DAY 3
SILT SOIL
Samsung Dual Camera
Shot with Murshi's Galaxy M10


DAY 3
GARDEN SOIL
Samsung Dual Camera

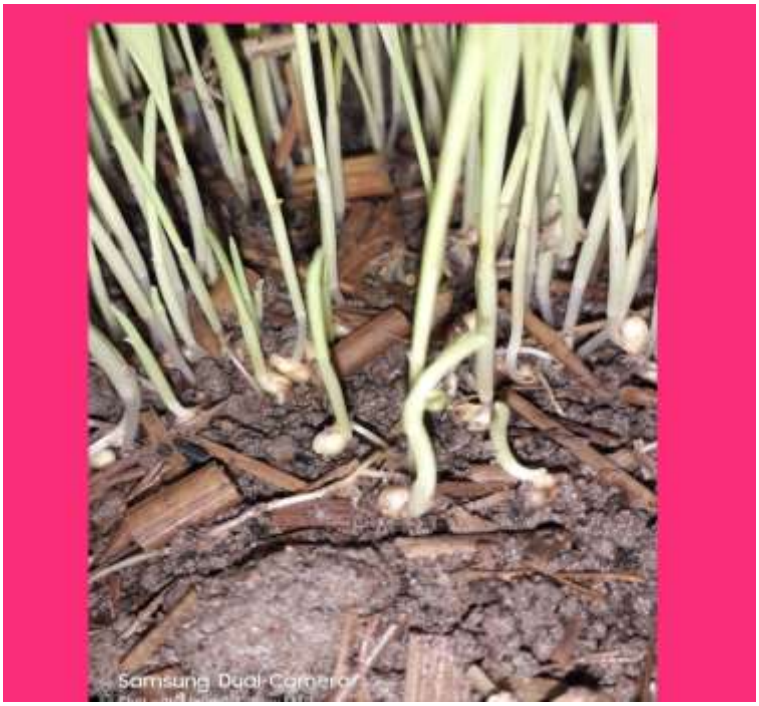

FUNGAL GROWTH


DAY 3


DAY 3
CONTROL
GARDEN SOIL


DAY 4
SILT SOIL
Samsung Dual Camera


DAY 4
GARDEN SOIL
Samsung Dual Camera


Samsung Dual Camera

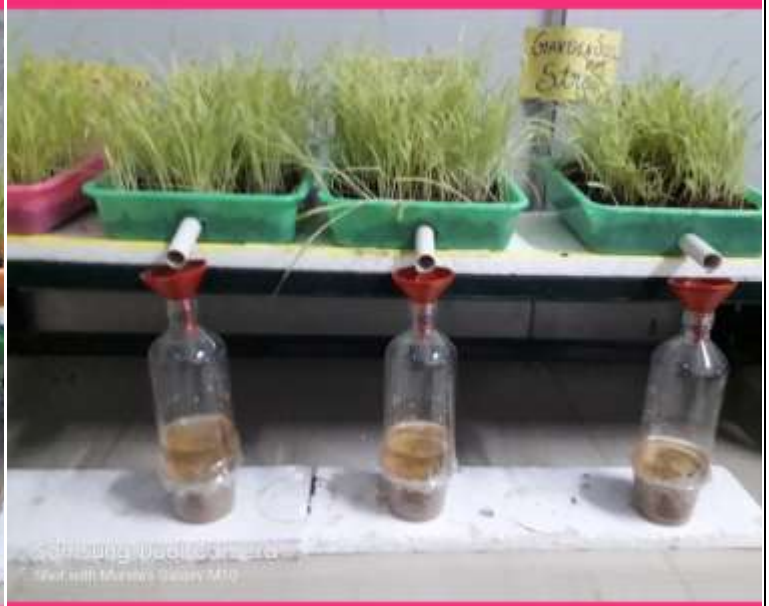

Dual Camera
Dual Camera


Samsung Dual Camera


CONTROL
Garden Soil
Straw
Garden Soil
Straw


SILT SOIL DAY 10
Samsung Dual Camera


GARDEN SOIL DAY 10
Samsung Dual Camera




COLLECTED WATER

Tabulation-EFFECT OF THE MULCHING MATERIALS ON WATER HOLDING CAPACITY OF GARDEN SOIL

DAY	Control	Paddy Straw			Husk			Saw dust 1			Saw dust 2			Coco Peat		
		50	100	150	50	100	150	50	100	150	50	100	150	50	100	150
Day 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Day 4	0	0	0	0	0	0	0	16	0	0	0	0	0	0	0	0
Day 5	19	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0
Day 6	41	0	0	0	0	0	0	26	0	0	0	0	0	0	0	0
Day 7	52	27	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Day8	56	36	0	0	58		59	56	0	67	29	25	0	0	24	15
Day 9	35	0	0	45	0	0	0	0	0	0	0	0	0	0	0	0
Day10	55	40	0	0	0	0	0	27	0	0	0	0	0	0	0	0
Day11	69	49	35	0	0	0	0	51	0	0	0	0	0	0	0	0
Day12	165	142	114	70	133	115	0	65	42	42	60	0	0	0	0	0
Day13	160	165	135	114	149	130	0	135	93	90	120	27	27	0	0	0
Day14	162	145	123	159	126	124	157	156	123	157	158	124	126	153	152	147
Day15	167	145	125	140	130	153	125	124	125	99	135	182	162	142	121	141
Day 16	185	187	189	185	190	195	150	192	190	142	185	185	180	154	22	105
Day 17	127	127	173	142	150	111	155	102	98	157	148	120	183	42	132	110
Day 18	150	165	170	163	160	158	153	145	134	165	143	154	150	147	110	139
Day 19	169	167	186	181	192	142	139	135	140	192	135	149	160	110	108	114
Day 20	189	136	161	175	157	141	173	132	149	151	171	167	145	95	97	89
AVG	**100**	**85**	**79**	**76**	**80**	**75**	**62**	**77**	**61**	**70**	**71**	**63**	**63**	**47**	**43**	**48**

EFFECT OF THE MULCHING MATERIALS ON WATER HOLDING CAPACITY OF SILT SOIL

DAY	Control	Paddy Straw			Husk			Saw dust 1			Saw dust 2			Coco Peat		
		50	100	150	50	100	150	50	100	150	50	100	150	50	100	150
Day 3	0	3	0	0	3	12	22	0	0	0	0	0	5.5	0	0	0
Day 4	0	9	0.5	0	1	1	2	0	0	0	11	0	0	0	0	0
Day 5	0	11	0	0	5	3	0	0	0	0	0	0	0	0	0	0
Day 6	2	1	0	0	50	2	0	0	0	0	26	0	0	0	0	0
Day 7	8	3	0	0	46	7	0	0	0	0	1	0	0	0	0	0
Day8	0	7	0	24	14	0	12	0	0	18	0	12	6	0	0	0
Day 9	0	0	0	0	45	0	24	18	0	0	26	0	0	0	0	0
Day10	21	19	45	0	57	0	0	39	0	26	43	0	0	0	0	0
Day11	54	45	65	0	60	20	47		17	35	52	0	0	0	0	0
Day12	120	125	75	55	157	122	33	142	70	85	142	42	26	0	0	0
Day13	115	165	167	100	177	160	132	160	109	100	129	75	96	183	0	0
Day14	168	141	126	114	156	125	158	98	152	123	152	154	168	152	96	93
Day15	125	119	103	130	124	103	130	136	157	135	154	141	135	152	142	123
Day 16	183	183	45	75	183	105	165	155	185	183	199	155	190	193	183	180
Day 17	145	165	172	165	149	155	150	172	131	120	122	133	134	130	87	80
Day 18	168	165	167	160	189	170	163	164	143	146	157	148	165	170	150	100
Day 19	173	167	177	165	184	187	189	142	145	139	149	142	152	128	126	121
Day 20	130	120	73	114	147	159	160	157	150	151	142	127	135	129	137	132
AVG	**78**	**80**	**68**	**61**	**97**	**73**	**77**	**81**	**70**	**70**	**84**	**63**	**67**	**69**	**51**	**46**

EFFECT OF THE TEST RETENTION MATERIALS ON WATER HOLDING CAPACITY OF GARDEN SOIL															
Mulching material	**CON.**	***P.S 50***	***P.S100***	***P.S 150***	***H 50***	***H 100***	***H 150***	***S.D 50***	***S.D 100***	***S.D 150***	***PSD 50***	***PSD 100***	***PSD 150***	***CO 50***	***CO 100***	***CO 150***
Amount of water collected	***100***	***83***	***79***	***74***	***77***	***71***	***57***	***74***	***61***	***66***	***70***	***59***	***63***	***46***	***38***	***44***

EFFECT OF THE TEST RETENTION MATERIALS ON WATER HOLDING CAPACITY OF SILT SOIL															
Mulching material	**CON.**	***P.S 50***	***P.S100***	***P.S 150***	***H 50***	***H 100***	***H 150***	***S.D 50***	***S.D 100***	***S.D 150***	***PSD 50***	***PSD 100***	***PSD 150***	***CO 50***	***CO 100***	***CO 150***
Amount of water collected	***78***	***80***	***68***	***61***	***97***	***74***	***77***	***81***	***70***	***70***	***84***	***63***	***67***	***69***	***51***	***46***

COMPARITION OF GARDEN SOIL AND SILT SOIL

A. CONTROL VERSUS PADDY STRAW

MULCHING MATERIAL	*GARDEN SOIL*	*SILT SOIL*
CONTROL	*100*	*78*
PADDY STRAW 50G	*83*	*80*
PADDY STRAW 100G	*79*	*68*
PADDY STRAW 150G	*74*	*61*

B. CONTROL VERSUS HUSK

MULCHING MATERIAL	*GARDEN SOIL*	*SILT SOIL*
CONTROL	*100*	*78*
HUSK 50G	*77*	*97*
HUSK 100G	*71*	*74*
HUSK 150G	*57*	*77*

C. CONTROL VERSUS SAW DUST

MULCHING MATERIAL	*GARDEN SOIL*	*SILT SOIL*
CONTROL	*100*	*78*
SAW DUST 50g	*74*	*81*
SAW DUST 100g	*61*	*70*
SAW DUST 150g	*66*	*70*

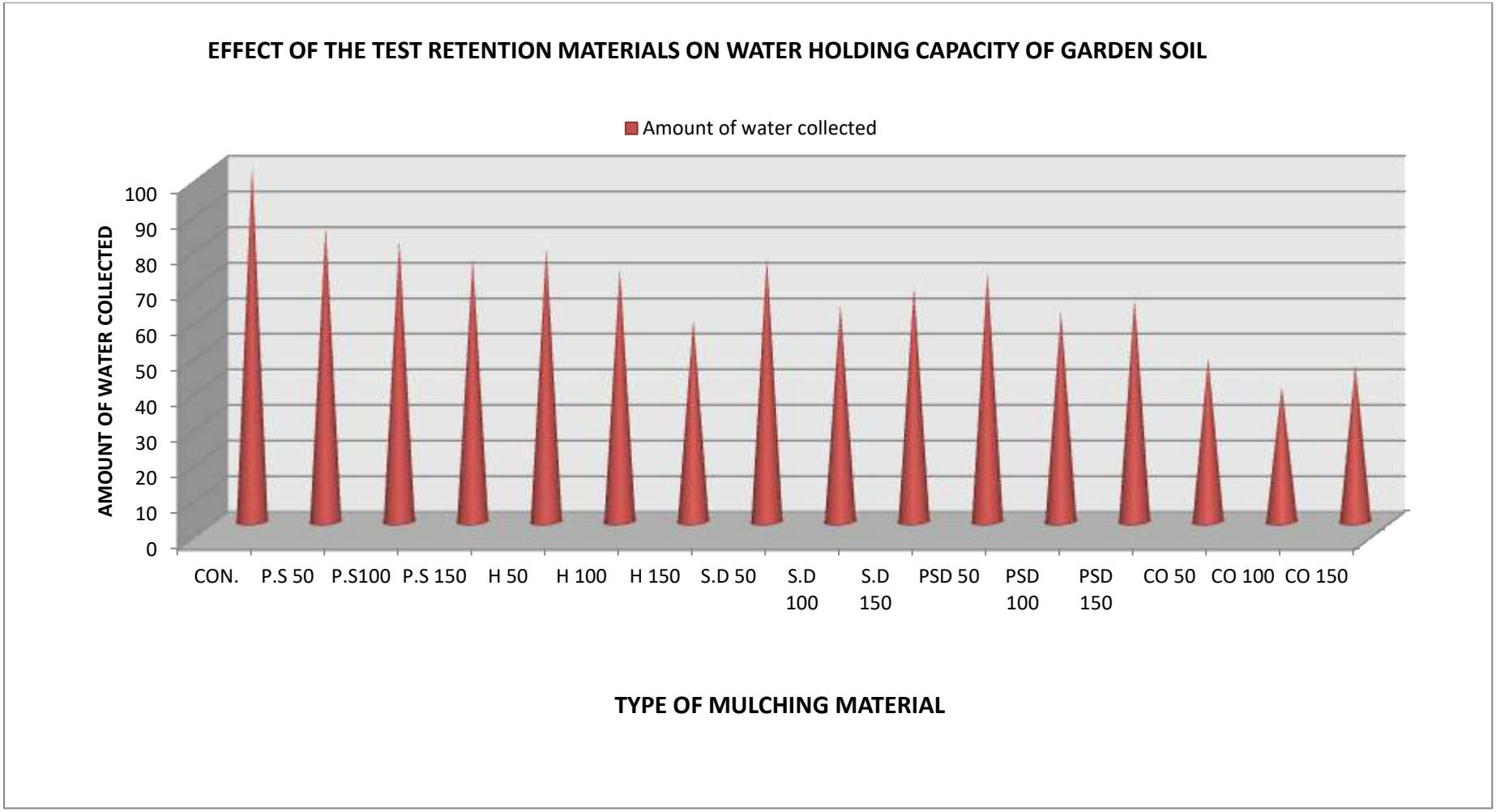
D. CONTROL VERSUS POWDERED SAW DUST

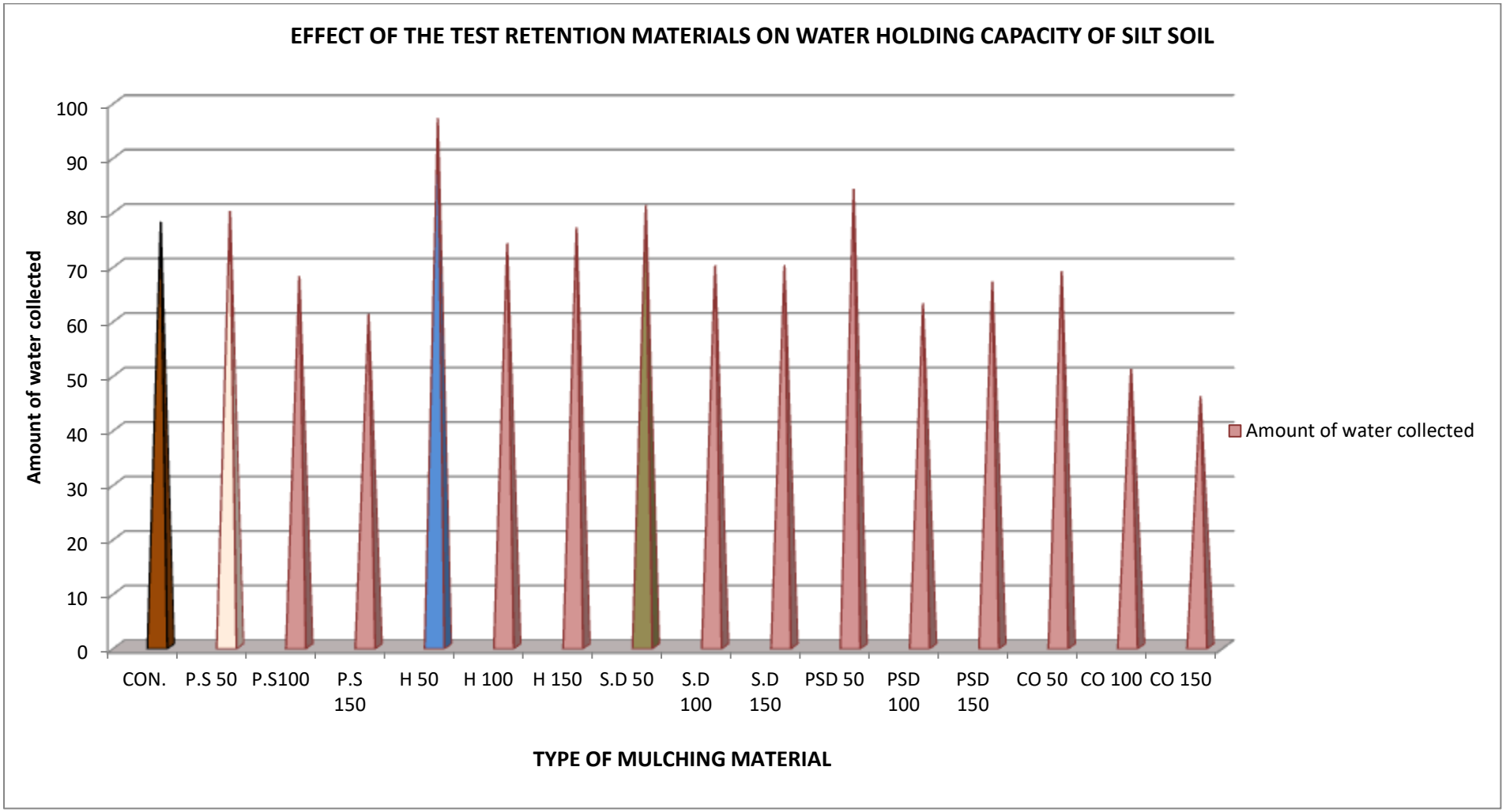
MULCHING MATERIAL	*GARDEN SOIL*	*SILT SOIL*
CONTROL	*100*	*78*
POWDERED SAW DUST 50G	*70*	*84*
POWDERED SAW DUST 100G	*59*	*63*
POWDERED SAW DUST 150G	*63*	*67*

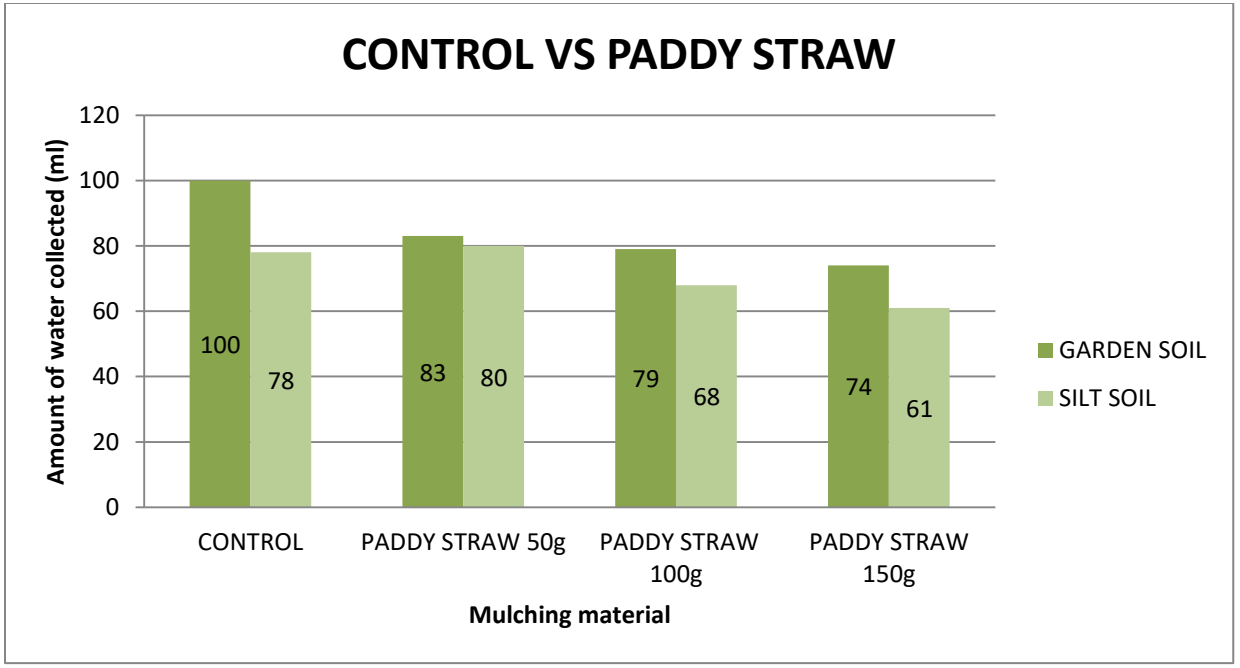
E. CONTROL VERSUS COCO PEAT

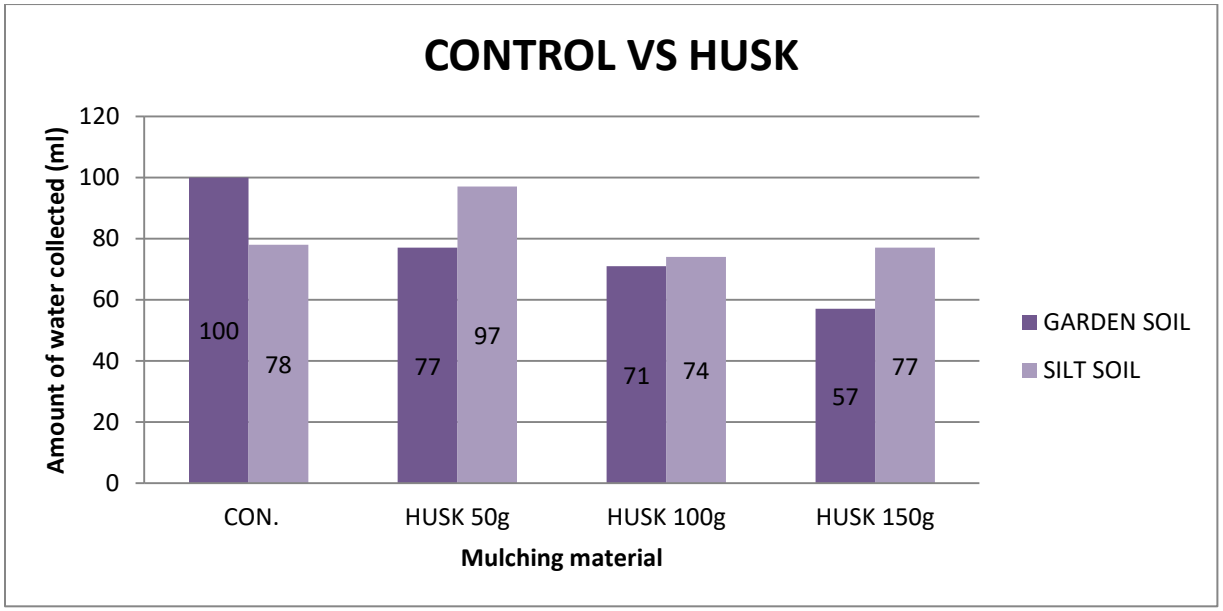
MULCHING MATERIAL	*GARDEN SOIL*	*SILT SOIL*
CONTROL	***100***	***78***
COCO PEAT 50G	***46***	***69***
COCO PEAT 100G	***38***	***51***
COCO PEAT 150G	***44***	***46***

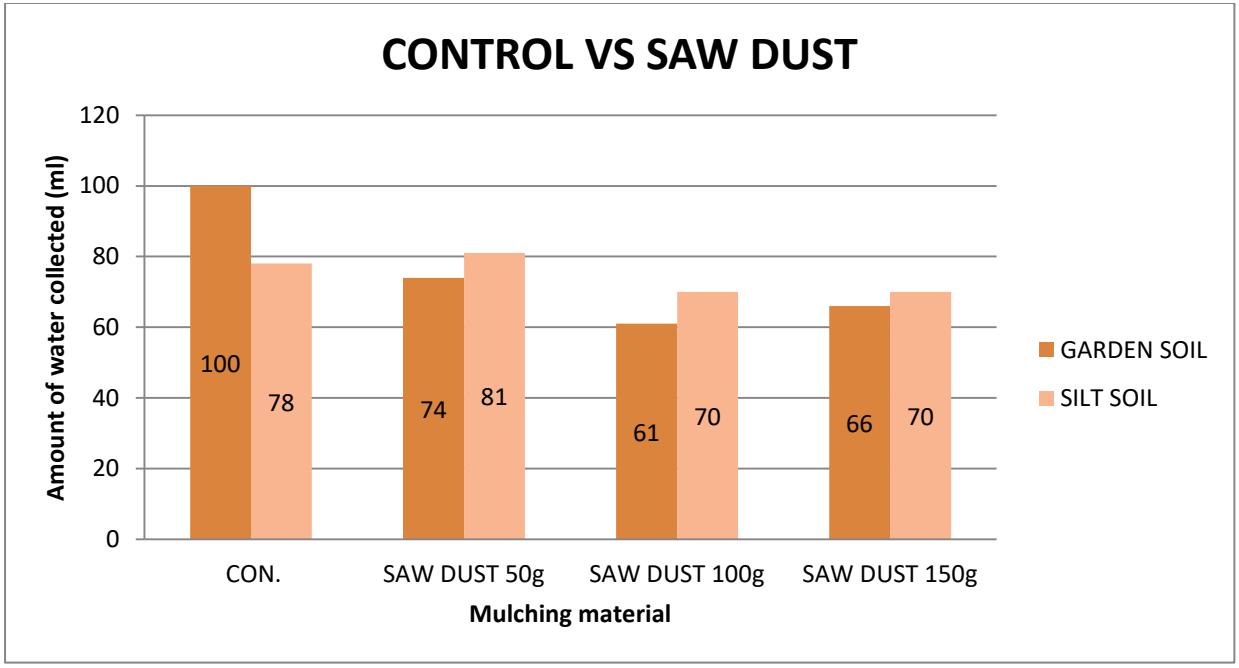
GHRAPHICAL REPRESENTATION

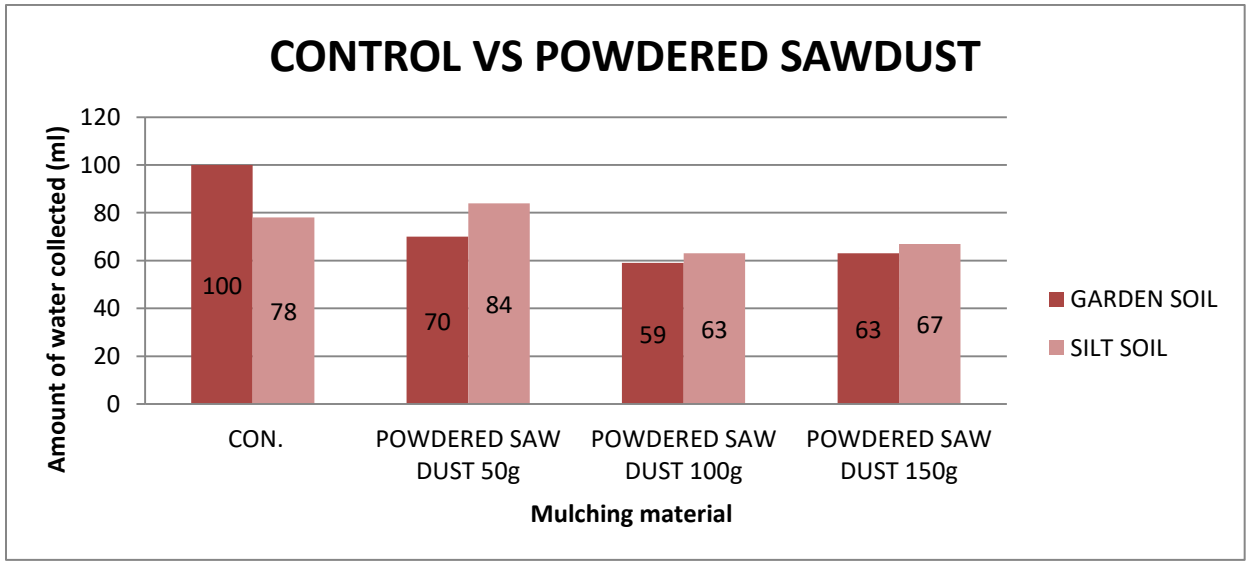


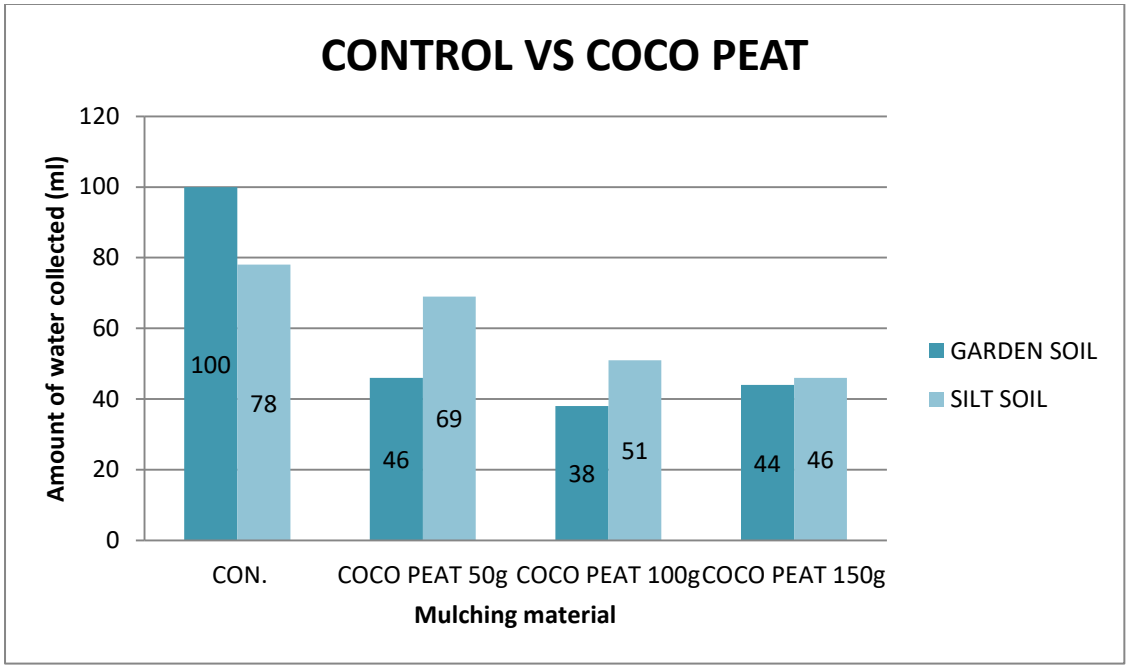

EFFECT OF THE TEST RETENTION MATERIALS ON WATER HOLDING CAPACITY OF SILT SOIL
Amount of water collected
100
90
80
70
60
50
40
30
20
10
0
CON.
P.S 50
P.S100
P.S 150
H 50
H 100
H 150
S.D 50
S.D 100
S.D 150
PSD 50
PSD 100
PSD 150
CO 50
CO 100
CO 150
TYPE OF MULCHING MATERIAL
Amount of water collected


CONTROL VS PADDY STRAW
Amount of water collected (ml)
120
100
80
60
40
20
0
100
78
83
80
79
68
74
61
CONTROL
PADDY STRAW 50g
PADDY STRAW 100g
PADDY STRAW 150g
Mulching material
GARDEN SOIL
SILT SOIL


CONTROL VS HUSK
Amount of water collected (ml)
120
100
80
60
40
20
0
100
78
77
97
71
74
57
77
CON.
HUSK 50g
HUSK 100g
HUSK 150g
Mulching material
GARDEN SOIL
SILT SOIL


CONTROL VS SAW DUST
Amount of water collected (ml)
120
100
80
60
40
20
0
100
78
74
81
61
70
66
70
CON.
SAW DUST 50g
SAW DUST 100g
SAW DUST 150g
Mulching material
GARDEN SOIL
SILT SOIL


CONTROL VS POWDERED SAWDUST
Amount of water collected (ml)
120
100
80
60
40
20
0
100
78
70
84
59
63
63
67
CON.
POWDERED SAW DUST 50g
POWDERED SAW DUST 100g
POWDERED SAW DUST 150g
Mulching material
GARDEN SOIL
SILT SOIL


CONTROL VS COCO PEAT
120
100
80
60
40
20
0
Amount of water collected (ml)
100
78
46
69
38
51
44
46
CON.
COCO PEAT 50g
COCO PEAT 100g
COCO PEAT 150g
Mulching material
GARDEN SOIL
SILT SOIL

RESULTS AND DISCUSSION

- In day 3, I observed that the plants start growing and that day I observed some of the plants were affected by fungus. Next day 4, I sprayed Neem seed water to reduce the fungal growth.
- I observed that plants were grown very fast in coco peat and paddy straw and both of them retained water very well in silt and garden soil (day 4).
- On day3, there is no water collected in the garden soil.
- Control of silt soil takes 5 days to grow plants.
- On day 4 & 5, the saw dust of 50g in garden soil release water.
- .For first 10days we pour 100ml of water. Next 10days we pour 200ml of water. In day3 to day10 most of water collects only in silt soil
- After day 15 the plants start to dry.
- Day 20 all the plants gets dried.
- Retention rate in Garden soil control seemed low comparing the silt soil, it may be due to irregular growth of plants in silt soil.
- Except control, retention material in garden soil works well; Garden control didn't retain the water. This may be due to irregular growth of plants
- **Control versus Paddy Straw:**
  - 150g of silt soil retain better than other garden soil.
  - 50g of garden soil retain less.
- **Control versus Husk:**
  - 150g of garden soil retains more water.
  - 50g of silt soil has less retention rate.
- **Control versus Saw Dust:**
  - 100g in garden soil retained more water that other concentration of saw dust in the soil.
  - 50g of silt soil has less retention rate in silt soil.
- **Control versus powdered saw dust:**
  - 100g of garden soil retained well in powdered saw dust.
  - 50g of silt soil retained less in powdered saw.
- **Control versus Coco Peat:**
  - 100g of garden soil was retained more amount of water in coco peat.
  - 50g of silt soil retained very less amount of water in coco peat.
- **Control of garden soil retains very less amount of water.**

- **50g of mulching materials in silt soil** in all the mulching material were retained very low amount of water when it compared to garden soil and **150g of mulching material** were retained well than other concentration. It refers that the low concentration of mulching material will not allow more water retention. Increasing amount of mulching material to the soil will improve the retention rate of water in the soil.
- ***Coco Peats' 100g retain the water most in garden soil and coco peat 150g retains the water most in silt soil.***

APPLICATION

- The provision of organic mulch has the objectives of protecting plant roots, maintaining soil moisture, minimizing rain water that directly fell to the soil surface so that minimize the leaching of nutrients, erosion and maintain the soil structure, maintain the stability of the temperature in the soil, and can contribute organic material.
- Excellent water retention properties. Coco peat needs less watering (up to 65%) as compared to the peat moss. It holds water rather than shedding it like the traditional peat moss.
- Naturally high lignin content present in organic mulching material promotes the development of favorable micro-organisms.
- Organic mulch encourages earthworms to arrive.
- Cost effective and rich in humus material in water retention materials.
- Organic Mulch can also play a positive role for soil and plants that protect the soil aggregates from the rain granules, increase the absorption of water by soil, reduce the volume and speed of the surface flow maintaining the temperature, Soil moisture, maintain the soil organic content and control the growth of weeds. Thus it can improve the crop yield both quality and quantity.
- Mulching helps to control the weeds that are in the gardens and beds.
- We apply this in the time when we have little amount of water but have more amount of plants to pour water. Less amount of water will be used for plants and it reduces water scarcity.

CONCLUSION

- My hypothesis "**Coco Peat Retain the Water Best in Garden soil**" has been proved.
- ***COCO PEAT and PADDY STRAW are*** the very best water retention material in plant growth. In garden soil the control releases more amount of water so here retention of water by mulching material in soil can be easily visualized.
- **Paddy straw 150g** release less amount of water in both the soil. Using mulching material will give raise to moisture content of the soil and it also give rise the plant growth. Soil water retention is very important for the continual growth of plants and the survival of the various organisms living in the soil. Organic mulching materials also helps reduce soil erosion.

FUTURE ENHANCEMENT

- Next time, I want to quantify the growth of plants and seeds in order to visualize the actual retention material.
- The science fair project can be repeated using different amounts of water and soils from different locations to compare the results.

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