Procedure:

The points below were considered before performing the experiments:

- When preparing biodegradable orange and avocado peel mixture (OAP) superabsorbent polymer (SAP) from orange peels, lemon juice was added to lower the pH of the mixture and neutralize the negative charges on the polysaccharide strands of pectin, so they could assemble into a network and form a gel.
- Avocado peels containing natural oils were added to orange peels containing previously extracted pectin, enabling emulsion polymerization. The process forms micelles, very small molecular containers that are hydrophilic on the outside and hydrophobic on the inside, along with super-long pectin polymers capable of absorbing a lot of water.
- For measuring the weight of a product using a digital weighing scale, the containers were weighed first and recorded and then the weight of the product was calculated by subtracting the weight of the container from the combined weight of the product and the container.
- The texture and type of the soil was measured using the Soil Jar test. In this test, two cups of soil was mixed with water and 1 tbsp. dish soap in a mason jar. The jar was left undisturbed for 2 days while particles settled down into three distinct layers of clay (on the top), silt (in the middle), and sand (on the bottom). The percentage of clay/sand/loam was calculated and then plotted on a soil texture triangle chart to confirm the type of soil used in step 4 below.

Step1: All the required materials were gathered.

Step2: Preparation of biodegradable orange and avocado peel mixture (OAP) superabsorbent polymer:

- The peels were removed from 19 organic oranges including as much pith as possible and finely cut.
- 100 ml of organic lemon juice, measured using a graduated beaker, was added to the orange peels and left for 2 hours.
- 1000 ml of distilled water, measured using a graduated beaker, was added to the finely cut orange peels and lemon juice, and the mixture was kept on the gas stove for heating. The timer was switched on as soon as the liquid began to simmer and the time taken for the peels to be softened was noted for personal reference.

- The mixture was strained overnight using a kitchen sieve with fine wire mesh. This strained liquid was stored in a mason jar inside a refrigerator for future experimental purposes.
- Nine organic avocados were peeled, finely cut, and added to the cooked orange peels.
- This mixture was sun-dried indoors until the peels were fully dried.
- The sun-dried peels were mixed with 250 ml of the strained liquid and the combined mixture was dried in a conventional oven for 15 minutes.
- The oven-dried mixture was ground into a powder in a blender. This crushed mixture served as the biodegradable OAP SAP and was stored in a mason jar for later experiments.

Step3: Measuring the average fold change of the water absorption capacity of OAP SAP in different water salinity concentrations

- Different sources of water (distilled/rain/tap/river/brackish) were collected in individual glass jars and the water salinity for each of the water sources was tested in parts per thousand (ppt) using a salinity meter and recorded in parts per million (ppm).
- 1 gram of OAP SAP was placed into 5 individual graduated beakers.
- Each type of water source with different water salinity concentrations was added to each beaker until the SAP could no longer hold any more. For accuracy, after 15 minutes, any excess water was carefully pipetted off so as not to disturb the polymer.
- Each of the beakers of water-swollen polymers was weighed and the fold change (final weight of the SAP /initial weight of the SAP) was recorded.
- The above steps were repeated for trials 2 and 3 and the readings were recorded.

Step4: Measuring the average water retention of different soil types (of increasing water permeability) amended with a specific amount of OAP SAP

- 220 grams of different types of soil (clay, loam, sand) of increasing water permeability were taken in the individual graduated beakers.
- 2 tablespoons of OAP SAP were added to each of the beakers and mixed thoroughly.
- Filter paper was placed in 3 individual funnels and the funnels were placed on top of the 3 individual graduated beakers.
- Each of the individual test samples (soil + OAP SAP) was placed on the filter paper in each of the 3 funnels and saturated with 50 ml of rainwater (represented by W1 in milliliter).
- The setup was left for 15 minutes undisturbed.
- The amount of water passed through the test sample and collected in each of the individual graduated beakers (represented by W2 in milliliter) was measured.
- The amount of water retained by each of the test samples was calculated using the formula ((W1-W2)/W1)*100

Step5: Measuring the average plant growth in increasing amounts of OAP SAP amended with highly permeable soil in 21 days

- Four planting pots were filled with 220 grams of highly permeable sandy soil and 1, 2, and 3 tablespoons of OAP SAP were added to the three pots. One pot, used for the control group, was left with no added SAP.
- One Lima bean seed was planted in each of the 4 pots and saturated with 50 ml of rainwater.
- All 4 pots were kept in the indoor greenhouse and monitored daily.
- On the 21st day after germination, plant height (in centimeters) in each pot was recorded.
- The above steps were repeated for trials 2 and 3 and the readings were recorded.