

POLYACRYLAMIDE POLYMER AS SOIL AMENDMENTS TO IMPROVE SOIL PROPERTIES

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ABSTRACT

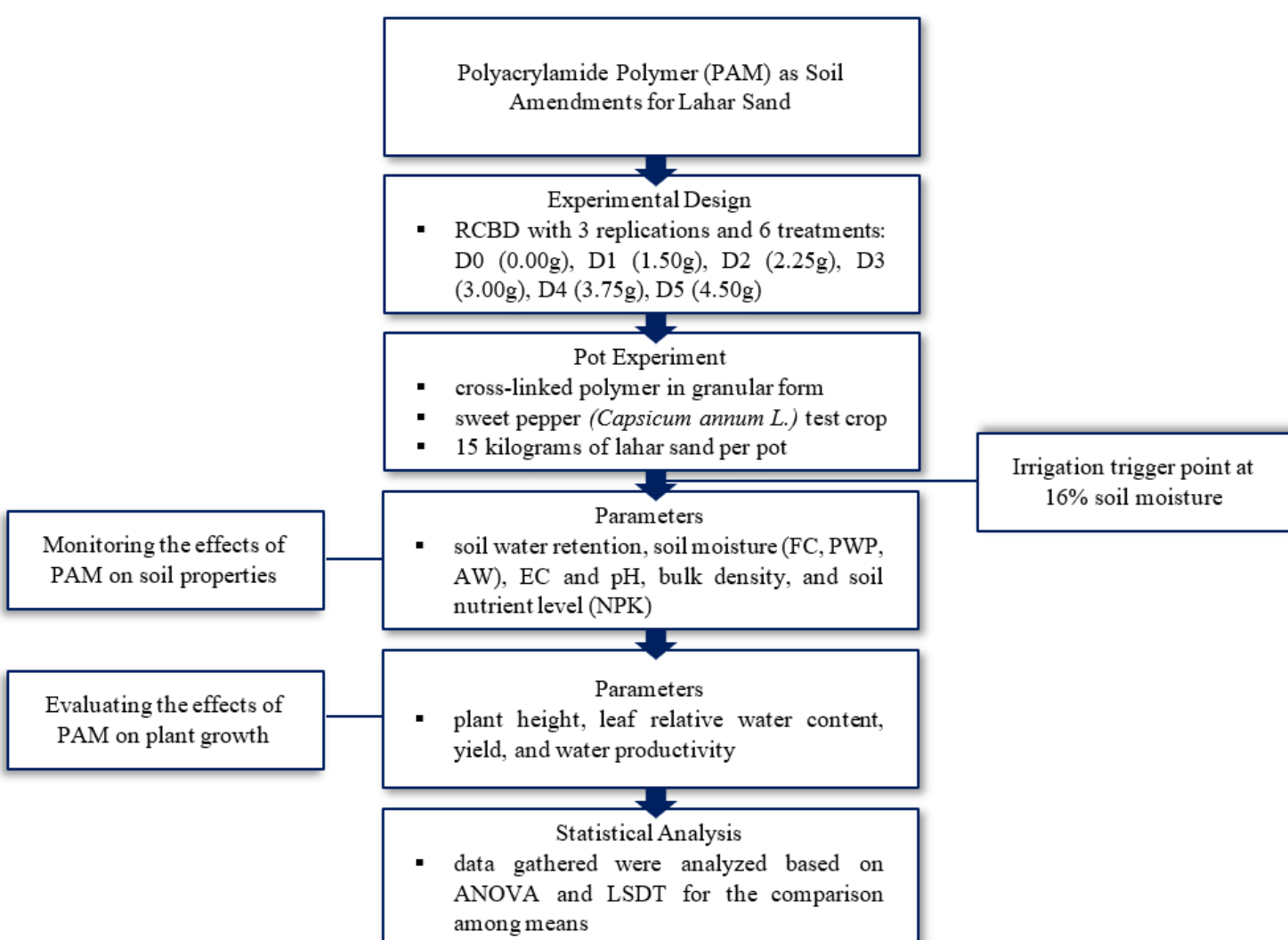
Limited water availability imposes problems in agriculture and a more challenging crop cultivation in lahar with poor water holding capacity and high susceptibility to heavy leaching. This study aimed to infuse polyacrylamide polymer as soil amendments in lahar sand to improve its soil properties. Six (6) doses of polymer were evaluated in a pot experiment. The results showed that water retention increased by 28% - 58% with the amendment of polymer consequently decreasing the number of irrigations to an average of 3 to 4 times in the whole cropping period and contributed to large water savings per pot. A decrease in bulk density up to 0.59 g cm^{-3} was also seen that further improved water movement in lahar sand. However, as polymer dose increases, the pH value reduces by 2% - 8% affecting the EC level as well. Nutrients N and P were also held in the soil at adequate and sufficient levels, respectively, but K was depleted in the amended soil. Furthermore, leaf relative water content, mean weight per fruit, and water productivity were significantly influenced by the soil amendment conserving 80% - 89% of water in producing one (1) kilogram of sweet pepper.

INTRODUCTION

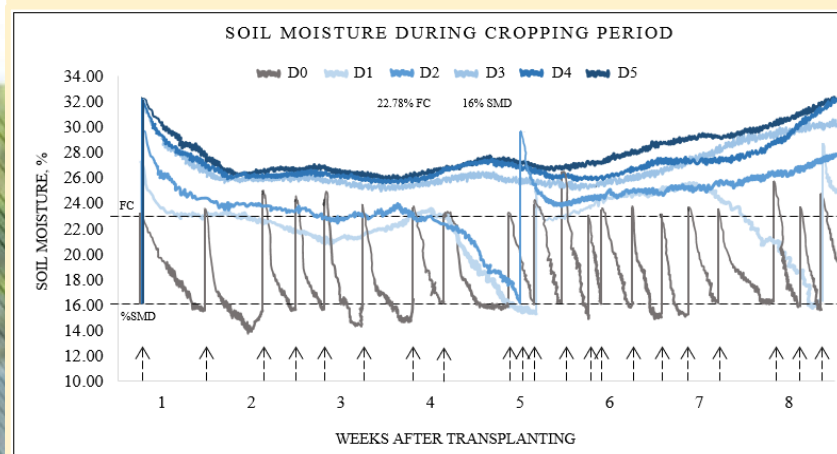
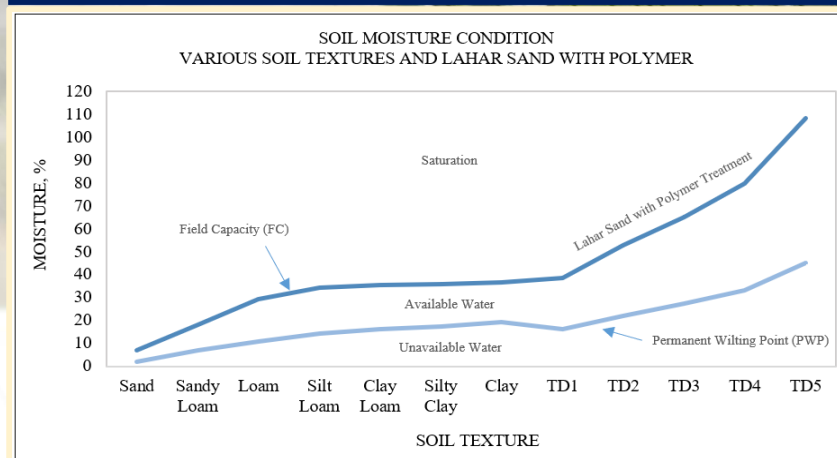
In the coming years, water will be more insufficient to support water-intensive farming practices. In this condition, lahar-laden areas are prone to drought due to its exhibited characteristics. During this time, the application of water and its managed use will be an essential factor in raising the productivity of agriculture and ensuring predictability in outputs, especially for lahar. The use of soil conditioners like cross-linked polyacrylamide polymer has great potential because of its capability to store extra water from the soil, 500 times its original weight, that enables crops to utilize the water over an extended period of time (Kumar, 2015; Dar et al., 2017).

This study aimed to observe the potential of polyacrylamide polymer, a water-retaining material, in improving the soil properties of lahar to promote crop growth and development and to make effective use of these areas especially in drought periods and post-monsoon months.

METHODOLOGY



RESULTS AND DISCUSSIONS



INCREASE

- water retention by 3 to 6 times
- available water by 41% to 79%
- soil moisture by 12% to 47%
- water savings by 75% to 82%

With the direct effect of improved soil moisture, soil compaction in lahar sand also decreased by 0.18 g cm^{-3} to 0.59 g cm^{-3} .

The amendment of polymer significantly decreases the need for irrigation in lahar sand from 20 irrigations per pot to 3 to 4 irrigations. Based on the recorded figures, the higher the polymer dose, the higher the water retained in lahar sand.

Treatments	pH	EC (dS/m)
D0 (0.00g)	6.2	0.15
D1 (1.50g)	5.6	0.31
D2 (2.25g)	5.4	0.39
D3 (3.00g)	5.4	0.57
D4 (3.75g)	5.1	0.77
D5 (4.50g)	5.0	0.93

There was a reduction in the loss of available nitrogen and phosphorus in the soil. However, the polymer dose affects the pH level varying from moderately to very strongly acidic class while EC levels remained in non-saline class.

T	Average Plant Height (cm)			Average Leaf Relative Water Content (%)			No. of Fruits (pc)	Mean Weight per Fruit (g)	Water Productivity (kg m^{-3})
	20DAT	40DAT	60DAT	20DAT	40DAT	60DAT			
D0	25.83	33.63	37.13	80.03	86.94	92.16	11.67	13.17	10.36
D1	29.63	37.60	40.57	89.09	91.60	92.77	17.33	19.97	90.14
D2	28.87	33.23	35.63	92.75	92.02	95.84	13.00	14.97	52.26
D3	27.00	34.13	36.23	92.36	91.43	93.28	10.67	14.73	61.54
D4	25.73	32.87	34.80	91.32	89.27	93.20	11.33	16.27	63.83
D5	23.93	32.03	33.13	92.64	90.52	93.95	12.33	14.93	52.55

Polymer-treated lahar sand has a higher number of fruits as well as higher mean weight per fruit than the untreated soil and have a significant effect on the leaf relative water content, but not so on the plant height of sweet pepper. Furthermore, water productivity increased significantly that shows that with the application of polymer, a large amount of water can be conserved and used effectively even in coarse-textured soil.

CONCLUSION

The use of polyacrylamide polymer as soil amendments for lahar sand, through observation and evaluation, has proven its capacity to improve soil properties and positively affect plant growth and development. The smallest dose at 1.50 grams of polymer per kilogram of lahar, in terms of plant growth, yield, and water productivity per liter, is found to be the suitable amount for this type of soil.

Literature Cited:

Dar, S.B., Mishra, D., Zahida, R., & Afshana, B.B. (2017). Hydrogel: To Enhance Crop Productivity per Unit Available Water under Moisture Stress Agriculture. Bulletin of Environment, Pharmacology and Life Sciences, 6(10), 129-135.
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