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Response of Different Sawdust Mulch Thickness On The Growth Performance of Tomato (*Solanum Lycopersicon.*) In Dry Sub-Humid Zone of Borno State, Nigeria

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ABSTRACT

A study was carried out in the demonstration farm of Ramat Polytechnic Maiduguri to investigate the response of different mulch thickness on the growth performance of Tomato (*Solanum lycopersicon*). The treatments include 1cm mulch, 2cm mulch, 3cm sawdust mulch and control (No mulch) which were laid out in a randomized complete block design (RCBD) and replicated three times. The results shows that growth parameter like plant height and yield has no significant difference between the treatments (p=0.005) but all treatment has some superioty to the control. It is evident from this work that soil moisture retention was higher with the use of 3cm mulch and weed suppression was also significant in 3cm sawdust mulch.
Keywords: Mulching, Thickness, Sawdust

I. INTRODUCTION

Improving water efficiency is an ongoing goal in agricultural production, especially in the Semi-arid zone of Nigeria, where water resources, drought, alongside rainfall distribution are manacling issues bedeviling agriculture. Mulching is one cultural practice which can be used to addresses this problem. Covering the ground with mulch saves water by preventing surface evaporation. The layer can also greatly reduce or eliminate weed propagation, which will also result in higher water use efficiency. Using certain agricultural byproducts as mulch is a sustainable practice which can reduce water use and provide other benefits as well. Saw dust, Wheat straw, grass clippings, and leaf debris are fairly abundant byproducts. Many producers already generate these mulching materials, and currently spend resources to dispose of them. Mulching using this waste is a cost effective practice which would conserve water, moderate soil temperature, reduce waste, and improve the soil. Considering the fact that each of these mulches is widely available, which depth of mulch is the most functional? This experiment was conducted to determine which of these depth of saw dust mulches functions best at conserving soil moisture and subsequent performance of Tomato. The information generated by this experiment can help producers choose the thickness that will best suit their mulching needs.

There seems to be rising cases or problem of poor plant growth and yield of Tomato in the semi-arid zone of Borno state, and all over the state which is due to lack of farmers knowledge of improved agronomical practices (E.g. mulching) they have cause a great reduction in the growth and yield of tomato and also the ignorance of farmers to change their method of agronomic practices and also to high level of illiteracy among farmers and to misinterpret the right message for the wrong information.

It is hope that this research work will provide solution to the problem of choosing best thickness of sawdust mulch for the optimum growth of tomato plant.

The objective of the research work is to determine the response of different mulching thickness on the growth performance of Tomato. Other objectives are to determine the effect of mulch thickness on soil moisture retention, and to determine which mulch thickness suppresses weed effectively.

II. MATERIAL AND METHODS

Experimental Site Description

The experiment was conducted at the Ramat Polytechnic Teaching and Research farm Maiduguri during the dry season between March to July, 2014. Maiduguri i.e. on latitude 1 1.4°N and longitude 13.05°E it has the altitude of 354m above sea level Itess T. M., (1988).

Experimental Design and Treatment

The experimental was laid out in a randomized complete block design (RCBD) and the treatments were replicated three times. The gross plot was (9.5m x 7.0m) consisting of 12 plots and the experimental unit was 2m X 2m, 0.5m in between and 0.25m are external boundary.

The treatments were different mulch thickness which are as follows;

T1 – 1cm
T2 – 2cm
T3 – 3cm
T4 - Control (No Mulch)

Total plants stand was constant as for the treatment and arrangement of the various treatment. the saw dust mulch was collected at Maiduguri timber shed. The clippings were allowed to dry out, and then the collections was used as the saw dust mulch. Seedlings of Tomato plants were sourced from local farmers at Alau village farm. Borno Sate Farm yard manure (Poultry) was applied to the Research Farm at 500g per plot.

During the establishing the whole plant watering was done once at two days interval, to investigate the water retention capacity of each treatment.

Parameters

Parameters that were measured and recorded are:

- Soil moisture content.
- Height of plant.
- Weed counts at 6 weeks.
- Yield at harvest.

Moisture Content

After all of the data were collected, the water loss for each experimental unit at each sampling was divided by the weight of the saturated soil to obtain percentage water loss. A repeated measures analysis of variance was then conducted, using mulch depth as between subject effects. Afterward, the mean separation was accomplished by single degree of freedom, comparing the No mulch depth to the combination of 1cm, 2cm depths, and the depth to the 3cm depth. The data analysis was conducted using the SAS Institute 2012 software package.

Weed Count

Emerged weed was recorded by counting the total number of emerged plant stands at 2 WAS, 4 WAS and 6 WAS at a random from net plots where the average mean was analyze in order to access the effect establishment of the crop.

Plant Height

The plant height of Tomato was measured with a graduated meter rule from the soil surface to the tip of the flag leaf at harvest, where five randomly selected plants in each plot was counting and average mean was computed.

Statistical Analysis

All data were subjected to analysis of variance using the ANOVA method and difference between treatments means were identified using least significant difference test (LSD).

III. RESULT AND DISCUSSION

Table I shows the result in respect of the three (3) assessed parameters, the effects of different mulch thickness on plant height, yield and moisture content. Plant height were not significant (p=0.05) in all the three level of mulching except the control treatment. Conversely treatment two (2) gave the best yield followed by treatment three (3) and one respectively as compared with treatment four (4). This result agress with (Abdul, 2005). Moisture content retention among the treatment shows some significant variability, were treatment three (3) which is the most densely thick mulch shows a promising good moisture retention capacity, followed by treatments 2 and 3 respectively, this result was in line with the findings of Abdul Hafeez and Abu-Gourk (1984). The higher moisture conversion under the thick mulch was mostly due to prevention of evaporation from the soil surface Puszai (1972).

Table 1: Mean and significance of the three assessed growth parameters for the four mulch thickness treatments on Tomato (*Solanum* l*ycopersicon.*)

S/No	Treatment	Plant Height	Yield	Moisture content
1.	1cm	23.967[a]	78.00[a]	68.33[b]
2.	2cm	21.600[a]	115.06[a]	82.23[b]
3.	3cm	23.667[a]	106.67[a]	129.13[a]
4.	Control	15. 970[b]	20.33[a]	36.67[c]
	P	<0.0021	<0.35	<0.0001
	F	18.06	1.32	58.89
	CV	7.09	80.57	10.97

Table 2: Effect of mulch thickness on weed suppression

S/No.	Treatment	Weed count
1.	1cm	69.10[a]
2.	2cm	80.73[a]
3.	3cm	83.60[a]
4.	Control	75.43[ab]
	L.S.D (5%)	9.71

All mulch depths were equally effective at suppressing the weeds, although there are no any significant difference between the treatments even at the 0.05 level. Samples covered with the thickest sawdust suppress weed growth.

IV. SUMMARY, CONCLUSION AND RECOMMENDATION

The results obtained from the field study carried out at the research and teaching farm of the Department of Agricultural Technology, Ramat Polytechnic Maiduguri during the dry season from March-July 2014, to examine the response of different mulch thickness on the growth performance of Tomato (*Solanum* l*ycopersicon.)* which shows that high plant height, less weed count and considerable yield on 3cm thick mulch, and low soil moisture and high weed count was recorded in 1cm mulch and control.

In conclusion although most of the mulch thickness have showed some promises, 3cm depth mulch had a high growth performance in comparison.

Therefore, for optimum growth production of Tomato under Borno state agro-ecological climate, it is recommended that 3cm mulch should use as an agronomic practice by farmers. It can be suggested that further researcher should be carried out along the following line;

- Other mulch thickness should also be used.
- Other crops should also be researched on different mulch thickness etc.

V. REFERENCES

[1]. Abdel-Hafeez, A.T. and Abu-Goukh, A.A. (1984) Use of plastic mulch on cumber (Cucumis sativus) production-under Sudan conditions. Sudan Agricultural Journal 10, 19-27.

[2]. Allison, F. E., and Anderson, M. S. The Use of Sawdust for Mulches and Soil Improvement. Circular No. 891, U. S. Department of Agriculture, November 1951.

[3]. Bollen, W. B. Mulches and Soil Conditioners: Carbon and Nitrogen in Farm and Forest Products Agricultural and Food Chemistry, Vol. 1, No. 5, P. 379. May 27, l953.

[4]. Boller, C. A. Growing Blueberries in Oregon. Station Bulletin 499, Agricultural Experiment station, Oregon State College, Corvallis. June 1951.

[5]. Borland, J. 1989. Mulch: is it always beneficial? Grounds Maint. 24(2): 10-12,14,120-121.

[6]. Einert, A.E., R. Guidry, and H. Huneycutt. 1975. Permanent mulches for landscape plantings of dwarf crape myrtles. Am. Nurseryman 141: 9,59,62-65.

[7]. Emmert, E., 1957. Black Polyethylene for Mulching Vegetables. American Society of Horticultural Science. 69, 464-469.

[8]. Hopkins, H.H. 1954. Effects of mulch upon certain factors of the grassland environment. J. Range Management 7: 255-258.

[9]. Hu, W., Duan, S., Sui, Q., 1995. High Yield Technology for Groundnut. International Arachis Newsletter 15, 1–22.

[10]. Jacks, G.V., W.D. Brind, and RobertSmith. 1955. Mulching. Technical Communication No. 49 of the Commonwealth Bureau of Soil Sci., Bucks, England.

[11]. Jacometti, MA, SD Wratten, and M Walter, 2007. Understorey Management Increases Grape Quality, Yield and Resistance to Botrytis Cinerea. Agriculture Ecosystems & Environment. 122, no. 3: 349-356.

[12]. Johnson, H. 1989. Plastigone Photodegradable Film Performance in California. National Agricultural Plastics Congress. 21, 1–6.

[13]. Kar, G., Singh, R., 2004. Soil Water Retention—Transmission Studies and Enhancing Water Use Efficiency of Winter Crops Through Soil Surface Modification. Indian Journal of Soil Conservation. 8, 18–23.

[14]. Khera, K.L., Singh, G., 1995. Effect of Paddy Straw mulch and Rainfall Intensity on Runoff and Soil Loss Under Stimulated Rainfall. Indian Journal of Soil Conservation. 23, 20–23.

[15]. Li, S. , & Xiao, L., 1992. Distribution and management of drylands in the people's republic of china. Advances in Soil Sciences, 18, 147-302.

[16]. Liu C.M., Zhang X.Y., Zhang Y.Q. 2002. Determination of Daily Evaporation and Evapotranspiration of Winter Wheat and Maize by Large-Scale Weighing Lysimeter and Microlysimeter. Agricultural and Forest Meteorology, 111, 109–120.

[17]. Nambiar, E.K.S., G.D. Bowen, and R. Sands. 1979. Root regeneration and water status of Pinus radiata (D. Don) seedlings transplanted to different soil temperatures. J. Exp. Bot. 30(119): 1119-1131.

[18]. Ossom, E.M., Pace, P.F., Rhykerd, R.L., Rhykerd, C.L., 2001. Effect of Mulch on Weed Infestation, Soil temperature, Nutrient Concentration, and Tuber Yield in Ipomoea batatus (L.)Lam.in Papua New Guinea. Tropical Agriculture, Trinidad. 78, 144–151.

[19]. Pusztai, A. (1972). Effect of mulching on soil and plant. Plastic in Agriculture, 5th International Colloquium, Budapest 1,584-590.

[20]. Rakow, D.A. 1989. The types and uses of mulch in the landscape. Cornell Coop. Ext. Home and Grounds Fact Sheets p. 700.10.

[21]. Rakow, D.A. 1992. Mulching: benefits backed by survey. Arbor Age 12(9): 22,27,29.

[22]. Schales, F.D. and R. Sheldrake, 1965. Mulch Effects on Soil Conditions and Muskmelon response. Proceedings, American Society for Horticultural Science. 88, 425-430.

[23]. Smith, A.M. and D.A Rakow. 1991. Strategies for reducing water input in woody landscapes. J. Arboric. 18(4): 165-170.

[24]. Steiner,J.L.,1989. Tillage and Surface Residue Effects on Evaporation from Soils. Soil Science Society of America Journal. 53, 911–916.

[25]. Uldrich, J.M. 1962. Cultural requirements for growth of excised ponderosa pine roots. Physiology of Plant. 15: 59-71.

[26]. Unger, P., 1974. Crop residue management. Proceedings, 15, 45-56.

[27]. Vaughan, E. K., Roberts, A. N., and Mellenthin, L L: The Influence Douglas Fir Sawdust and certain Fertilizer Elements on the Incidence of Red stele Disease in Strawberry. Technical Paper No. 839. Agricultural Experiment Station, Oregon State College, Corvallis. May l954

[28]. Verma, H.N., Singh, R., Prihar, S.S., Chaudhary, T.N., 1979. Runoff as Affected by Rainfall Characteristics and Management Practices on Gently Sloping Sandy Loam. The Journal of the Indian Society of Soil Science. 27, 18–22.

[29]. Waggoner, P.E., Miller, P.M., and DeRoo, H.C., 1960. Plastic mulching: Principles and Benefits. Connecticut Agricultural Experiment Station Bulletin, New Haven. 634-644.

[30]. Watson, G.W. and G. Kupkowski. 1991. Effects of a deep layer of mulch on the soil environment and tree root growth. J. Arboric. 17(9): 242-245.