Effect Of White Clover (*Trifolium repens*) Living Mulch On The Growth Of Tomato Plants (*Lycopersicon esculentum*) And Associated Weeds.

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Introduction

Living mulch effectively reduce soil erosion, fix atmospheric N in amounts almost sufficient for the need of the subsequent crop, improve soil organic content, increase soil water holding capacity, and reduce weed competition and damage caused by certain pests (Abdul-Baki et al, 1993). A living mulch system is more complex than conventional, clean-tilled systems and is not suited to all situations. On the other hand, only in creating a more complex, diverse agro-ecosystem is there a potential for beneficial interactions. The loss of diversity greatly weakens the tight functional links between species that characterize natural systems. As diversity increases, so do opportunities for coexistence and beneficial interference between species that can enhance agro ecosystem sustainability. Diversity – especially that of below ground performs a variety of ecological services that have impacts to both on and off the farm, such as nutrient recycling. Living mulches have poten! tial as an alternative approach for weed control that could allow an important reduction in herbicide dependency. (Hutchinson and McGiffen, 2000). Short-term economic incentives have discouraged the inclusion of living mulches making long-term soil maintenance increasingly difficult (Grubinger and Minotti, 1990).

Plants in association interfere with each other through environmental modification, allelopathy or competition. This is influenced by the environmental conditions, resource levels, growth characteristics of the interacting species and proximity factors such as density, species, proportion and spatial arrangement. The effect of intercropping tomato (*Lycopersicon esculentum*) and white clover (*Trifolium repens*) on tomato fruit yield, ground cover, weed suppression and tomato height measurements as an indication of interference were studied in test plots at California Polytechnic State University, San Luis Obispo. The experiment was conducted as a randomized complete block design with two treatments, three replications for the living mulch treatment and four replications for the pure stand treatment. The land for the experiment was prepared by conventional tillage, listed and shaped into raised beds 80 centimeters wide using a PTO-driven bed shaper.

Materials and methods

An experimental unit had four rows, with seven tomato plants in a row. Plant spacing was 35 cm between plants and 75 cm between rows. The living mulch seeds were broadcasted 06/20/00 at a rate of 30 pounds per acre. Tomatoes were transplanted on 07/20/00 and the fruit harvested between 10/10/00 and 10/25/00.

Results and discussion

There was no significant difference in the fruit yield obtained from the tomato pure stand and the intercropped treatment. The pure stand averaged 175 kg/ha as compared to the inter crop plots which averaged 152 kg/ha.

There was however a significant difference in weed cover between the two treatments. Weeds covered 58% of the ground surface in the pure stand nine weeks after transplanting the tomatoes, and only 21% in the intercrop system quadrant method. Using the transect method, it was 43.8% weed cover in the living mulch treatment and 25.8% in the intercrop system seven weeks after transplanting the tomatoes. In both treatments the most prevalent weeds were common mallow (*Malva neglecta*), redroot pigweed (*Amaranthus retroflexus*) and common purslane (*Portulaca aleracea*). Similar results were observed by Brandsaeter, 1998 whereby early in the season, there were no differences in weed biomass or numbers observed between a monocrop and a white cabbage living mulch treatment, but the weed biomass and numbers became significantly lower in the living mulch treatment late summer. In the same experiment, both subclover and white clover gave significantly more marke! table cabbage heads than monoculture due to less insect damage

Fig 1. Percentage groundcover seven weeks after transplant – transect method. Different letters mean significant differences exists between treatments $p<0.05$

Fig 2. Percentage ground cover nine weeks after transplant – quadrant method. Different letters mean significant differences exists between treatments $p<0.05$

Two weeks after transplanting the tomato, there was no significant difference in the tomato plant height between the two treatments, but this changed three and four weeks into the growing season. Crop-weed competition was more severe in the intercrop stand as evidenced by the stunted growth of the tomato plants. On average for the first two weeks, the tomato heights were 20.4cm and 30.2cm for the intercrop system and 26.4cm and 39.7cm for the monocrop system. The third and fourth weeks averages were 40.0cm and 44.6cm for the intercrop and 48.7cm and 53.0cm for the monocrop system respectively.

There was no significant difference in biomass harvested from a pure stand tomato plot (5.45 kg/plot) and an intercropped or living mulch stand (5.66 kg/plot). The lack of an effect on biomass by the treatments could be an indication that even with interference, there were still ample nutrients available, possibly including nitrogen fixed by rhizobia on the roots of the white clover.

Living mulch has shown considerable potential as a N source and a means of improving weed control in cropping systems. Simple models that can predict biomass production, N accumulation and supply, and water use for different planting windows would greatly assist growers in deciding the feasibility of including a living mulch in a given planting system. Successful mixed crop communities around the world offer fruitful ground for research on how avoidance of competition, or coexistence, plays an important ecological role in cropping systems.

References

Abdul-Baki., A.A., and J.R. Teasdale, 1993. A no-tillage Tomato production system using hairly vetch and subterranean clover mulches. Hortscience 28(2): 106-108

Brandsaeter, L.O., and L.O. Netland, and J. Meadow. 1998. Yields, weeds, pests and soil nitrogen in a white cabbage living mulch system. Biological and Horticulture. J. 16(3):291(Astr.)

Hutchinson, C. M and McGiffen, Jr. 2000. Cowpea cover crop mulch for weed control in desert pepper production. Hort Sci 35(2): 196 –198

Grubinger, V.P. and P.L Minotti. 1990. Managing white clover living mulch for sweat corn production with partial rototilling. Amer. J. Alt. Agr. 5:4-12.