Management Practices to Minimize Stormwater Pollution from Macrotunnel Production Systems

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Macrotunnel production contributes > $1 billion to the California economy. Stormwater runoff in plasticulture tunnel post rows causes soil erosion, pollution and promotes weed growth. This comes at a cost to the grower/land owner and the environment.

Objectives:

1) Evaluate practices for post-row management for runoff and weed management and compare their feasibility
2) Develop guidelines for macrotunnels users

The Project

- The project was initiated at two locations (Somis and Santa Maria, CA) at newly installed raspberry plasticulture tunnels.
- Treatments were arranged according to the RCB design with three replications

Treatments:

Post rows (350 ft by 5 ft) remained **untreated** (grower standard) or received one of the four treatments:

1) **Barley cover crop** planted at 500lbs/A, terminated at heading with sethoxydim and mowing , as needed;
2) **Weed barrier** fabric placed on soil surface and pinned;
3) **Yardwaste mulch** (1-4 inch particles) applied 2-3 inches thick;
4) **Polyacrylamide (PAM, 'Simplot Soilbuilder')** applied at ~2lbs/A before rain events

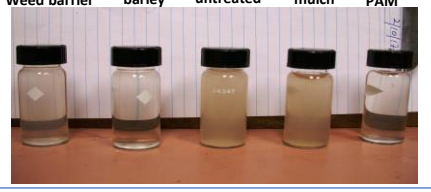
Sampling:

- Runoff during the first season of this 3-year project was collected at six rainfall events when flow was sufficient to collect grab samples at post row exit points. Runoff collection system and flumes will be installed for auto-sampling in the following seasons
- Weed densities were determined twice per season in all post rows.

TREATMENTS	Turbidity in Runoff	Nitrogen and phosphorus	Weed control
Untreated	Turbidity of runoff ranged from 355 to 614 nephelometric turbidity units at 4 sampling events	**N03 + NO2** : ranged from 0.25 to 1.75 mg/L **Total P:** ranged from 0.23 to 1.2 mg/L Concentrations depended on runoff intensity.	Combined densities of all species (annual sowthistle, little mallow and common groundsel) were 206 and 651 plants/1750ft² post row area In Nov. 2016 and Feb. 2017
Barley cover crop	Reduced significantly (*P*=0.05) 40-59%	**N03 + NO2** : Significant (*P*=0.1) reduction (48%) only during 1 out of 6 rain events. **Total P:** Significant (*P*=0.05) reduction (compared to Untreated) of 34, 48 and 50% during the 3 of 6 rain events	Weed densities were reduced significantly (*P*=0.05) : 87% in Nov 2016, but only 48% in Feb. 2017 when barley straw mulch deteriorated.
Weed barrier	Reduced significantly (*P*=0.05) 55-85%	**N03 + NO2** : No significant differences from Untreated during all rain events. **Total P:** Significant (*P*=0.05) reduction (compared to Untreated) of 35, 58 and 61% during the 3 of 6 rain events	Weed densities were reduced significantly (*P*=0.05) : 98% at both evaluations. The only weeds present were germinated from soil accumulated in some sections on top of the weed barrier
Yardwaste mulch	Reduced significantly (*P*=0.05) 74-94%	**N03 + NO2** : No significant differences from Untreated during all rain events. **Total P:** No significant differences from Untreated during all but 1 rain event, when concentrations were 22% greater (*P*=0.05)	Weed densities were reduced significantly (*P*=0.05) : 90% in Nov 2016 and 80% in Feb 2017.
PAM	Reduced significantly (*P*=0.05) 88% when applied before rain. When soil disturbed after application, turbidity was similar to Untreated.	**N03 + NO2** : No significant differences from Untreated during all rain events. **Total P:** Significant (*P*=0.05) reduction (compared to Untreated) of 47 and 48% during the 2 of 6 rain events	PAM did not have significant effect on weed densities which were similar to Untreated at both evaluations.

Observations:

- **Barley** needed to be re-seeded to maintain effective ground cover, mowing near heading stage provided effective straw mulch
- **PAM** efficacy greatly diminished if soil was disturbed between the application and rain/runoff
- **Mulch** was washed away in small areas near ends of post rows during strong runoff events and had to be replaced



Future seasons work:

- Install auto-sampling systems for runoff collection
- Collect and analyze data from both sites
- Conduct outreach events and process stakeholder feedback
- Assess economic feasibility of these management practices
- Develop guidelines for plasticulture tunnels users and industry

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