RECOMMENDED SPRAY RIG DESIGNS FOR CALIFORNIA STRAWBERRIES

Caleb Fink[12], Miriam Mendez[1], Jasmine Rodriguez[1], Carolina Lobo[1], Andrew Molinar[1], John Lin[12]

1 California Strawberry Commission, San Luis Obispo, California, USA

2 California Polytechnic State University, San Luis Obispo, California, USA

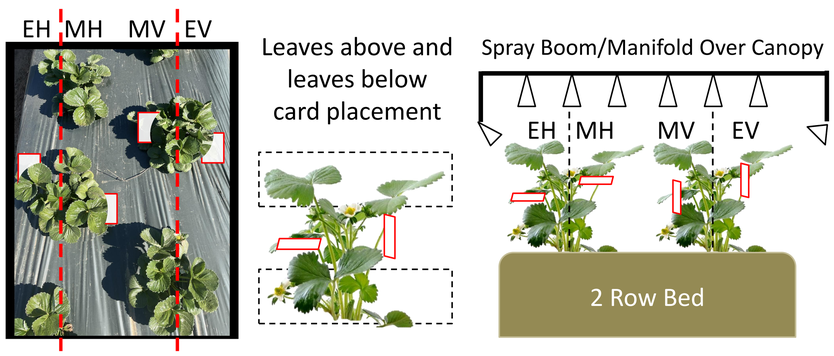
Introduction

This work provides recommended spray rig designs for 2 and 4-row California strawberry production. Spray rig coverage depends on multiple factors including weather, operating conditions, and sprayer design. Sprayer design was the focus for this study, with pressure, number of nozzles, nozzle type, and manifold design being the parameters of interest. Over 2,000 water sensitive spray cards were used to evaluate spray rig designs in 2 and 4-row strawberry beds throughout California.

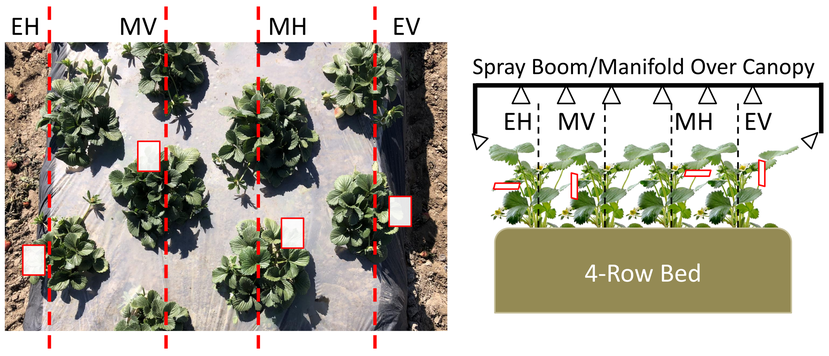
Spray Card Methodology

Cards were placed both horizontally and vertically on plant canopies near the middle and edge plants of the beds for the evaluations. Cards were labeled and placed as follows: 2 edge cards (EH & EV) and 2 middle cards (MH & MV). Horizontal cards were placed with white side facing up, and yellow (sensitive) side facing down. Vertical cards were placed with yellow (sensitive) side facing away from direction of tractor travel. Mini binder clips were used to hold the card on the plants.

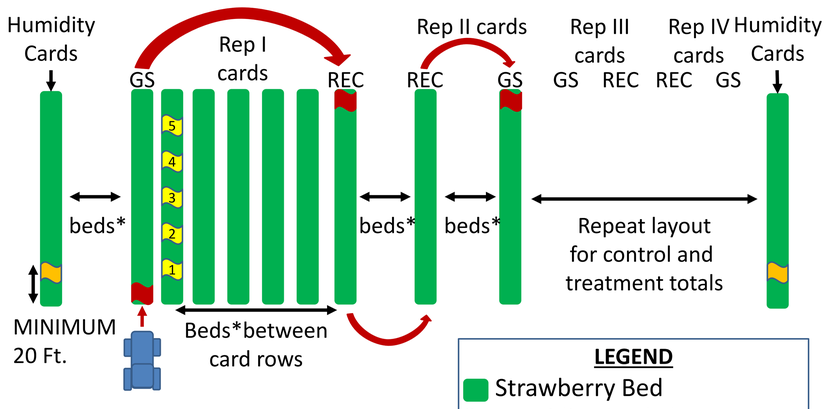
2-Row Card Placement in Canopy Per Flag



4-Row Card Placement in Canopy Per Flag



Trial Layout

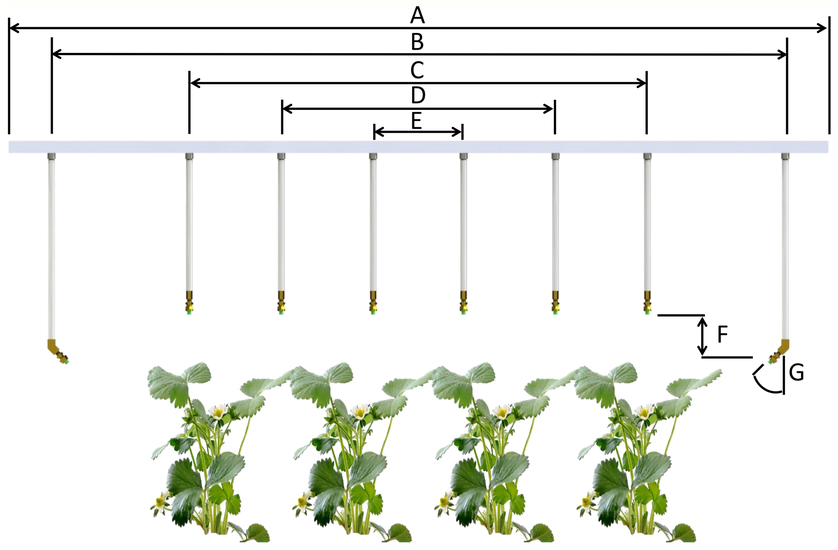


Cards are placed in the tractor row.
Flags are placed in the row adjacent to the tractor row.
Beds: 5 beds for 2-row, 7 beds for 4-row*

4-Row Spray Rig Recommendation (Santa Maria & Oxnard)

Our recommended manifold design for 4-row beds is 8 nozzles per bed, spraying at a pressure of 108 psi. The recommended nozzle is Teejet Conejet Green TXR80036VK or an Albuz ATR80 Green with a hollow cone spray pattern. We evaluated this manifold design at a rate of 150 gallons per acre and tractor speed of 2.88 mph. Results (n=25) show that using hollow cone Conejet nozzles, minimizing spray overlap, and positioning the nozzle closer to the canopy level can significantly increase coverage.

4-Row Rec. Design on a Spray Rig

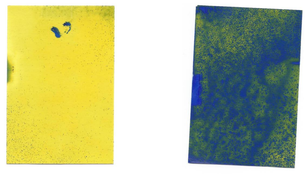


4-row Design Dimensions		
Bed Spacing	64	68
A	58	64
B	56-7/8	60-7/8
C	33-7/8	38
D	20-1/4	22-3/4
E	6-3/4	7-1/2
F	4	4
G	45 degrees	45 degrees
All dimensions in inches except where stated		

Spray coverage as determined by water-sensitive paper protocol		
Spray Rig Design	**Grower Standard**	**4-Row Rec****
7/2/19	46%*	85%*
8/28/19	40%*	70%*
2/6/20	62%	74%
4/3/20	24%	41%

*Statistically significant (P<0.05)
**Adjustments were made to meet each respective grower's spraying needs
Please note: wind speed, temperature, and humidity were measured during the trials.

Water Sensitive Spray Card Examples

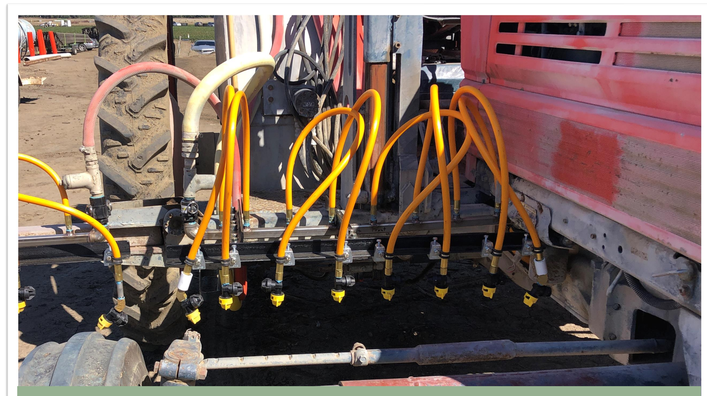


Water sensitive spray cards used to evaluate spray coverage.

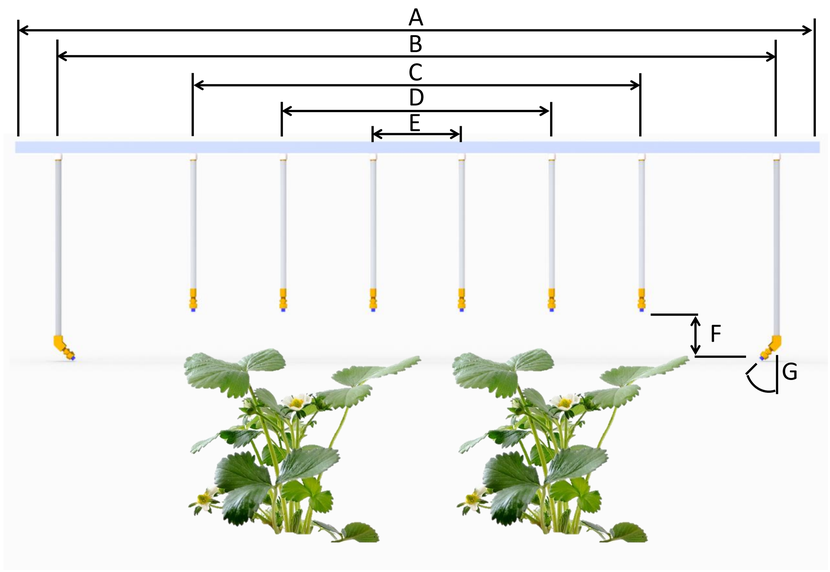
Nozzle Components

2-Row Spray Rig Recommendation (Watsonville & Salinas)

Our recommended manifold design for2-row beds is 8 nozzles per bed, spraying at a pressure of 100 psi. The recommended nozzle is TeeJet Even Flat Spray Tip TP8003EVS Blue with an even flat fan pattern. We evaluated this manifold design at a rate of 133 gpa and tractor speed of 3.24 mph. Results show that using even flat fan nozzles, minimizing spray overlap, and positioning the nozzle closer to the canopy level can significantly increase coverage.



2-Row Rec. Design on a Spray Rig



2-row Design Dimensions		
Plant Row Spacing	12	16
Bed Spacing	48 or 52	48 or 52
A	48 or 52	48 or 52
B	41	45
C	20-1/2	26-1/2
D	12	16
E	5-1/4	5-1/4
F	2-3/4	2-3/4
G	45 degrees	45 degrees
All dimensions in inches except where stated		

Spray coverage as determined by water-sensitive paper protocol		
Spray Rig Design	7/21/22 & 8/11/22	8/3/22 & 9/23/22
Grower Standard	37%**	32%*
2-Row Rec	34%**	47%*

*Statistically insignificant. Placed 80 horizontal cards per treatment over 4 beds. The recommended design used 2 less nozzles than the grower standard at 10 nozzles.
**Statistically insignificant. Placed 80 horizontal cards per treatment over 4 beds.
Horizontal cards achieved on average 35% spray coverage in a study of over 1700 cards.
Please note: wind speed, temperature, and humidity were measured during the trial.

Conclusion

Recommended 2-row design and a recommended 4-row design for low performing spray rigs was presented. It is important to note that proper maintenance, calibration, and spraying at canopy level ensures improved distribution uniformity and overall spray coverage and that it is possible to achieve a 30% increase in coverage for a poor performing rig.