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Growth responses of Three Annual Clovers to treatments with 2,4-D—Part II

Conclusion of a two-part article started in the July issue of California Agriculture.

Applications of 2,4-D to annual clovers growing on the range in El Dorado County generally affected dry matter production of subclover much less than that of rose clover. Rose clover yield was higher when the treatment date was later, but was never higher than the untreated plots. The dry matter yields were significantly reduced by spraying at the high rate at either of the first two dates.

Seed Yield Reduced

Seed yield of rose clover was severely reduced at all rates and dates of application. Subclover seed production was markedly reduced by the high rate of 2,4-D at all dates. Seed production was reduced relatively more severely by the 2,4-D treatments than was dry matter production. Again, the two species showed a difference, with subclover exhibiting more tolerance to 2,4-D.

Germination was considered to be normal when the plants showed no constricted root tips, swollen roots, or stunted growth. Since some treated rose clover plots did not produce any seed, and others produced a very small amount germination figures for this species were incomplete. Normal germination of subclover treated on March 30 was similar to the nontreated plots. Normal germination fell off sharply with later dates of treatment, particularly at the higher treatment rate.

The percent cover of the clovers in the following growing season—not shown in the table—reflected the effect of 2,4-D treatments on seed production in the previous year. For instance, a marked effect was shown in the April 29 treatment of subclover at the 3-pound rate. Cover the year following treatment was only about 12 per cent as compared to untreated plots with 32 per cent.

Cultivated Conditions

Early—April 17—2,4-D applications at the 0.3 pound per acre rate caused reductions in the dry matter production of all three species—rose, sub and crimson—in the cultivated experiment conducted at Davis. At the higher rate—3.0 pounds per acre—the dry matter production was reduced even more sharply. Subclover was the least affected of the three species.

Later spray applications—May 22—affected dry matter production much less. The production of rose clover was unaffected at either rate of 2,4-D. The trend toward reduced dry matter production of crimson clover was not statistically significant. Application on this date did have an effect on subclover production with similar reductions at both rates. The difference between species in this case was probably due to the fact that both the crimson clover and rose clover had almost finished their vegetative growth at the time of treatment while subclover was still actively growing. Subclover, therefore, appears to be susceptible to 2,4-D injury somewhat later than the other two species.

Early treatment with either rate caused reductions in seed production of all species, the high rate being more severe. Only subclover produced an appreciable amount of seed per acre after application of 3.0 pounds per acre. At both rates, the reduction in seed production paralleled that in dry matter.

This parallel between seed production and dry matter production was no longer evident when the late application was made. All species showed some reduction in seed production after application at either rate on this date, with the most pronounced effect at the higher rate. Rose clover showed a sharp reduction at the 0.3 pound per acre rate. Crimson clover produced more seed than rose clover at the higher rate, probably because the crimson clover was more mature at this date.

Normal germination of seed was significantly affected by differences in rate of spray material and time of application. When spray was applied early at the 0.3 pound per acre rate only rose clover was significantly affected. At the higher rate normal germination was reduced in rose and crimson clover but not in subclover.

When 2,4-D was applied at either rate on May 22, normal germination of rose clover and crimson clover was sharply

Range Conditions

	Dry matter lb/A	Seed lb/A	% Normal germination
No 2,4-D			
Rose	500	40	..
Sub	550	22	80
March 30—Vegetative—			
0.3 lb/A 2,4-D			
Rose	160	3	..
Sub	550	16	77
3.0 lb/A 2,4-D			
Rose	20	0	..
Sub	300	3	80
April 29—Early-full bloom—			
0.3 lb/A 2,4-D			
Rose	230	1	..
Sub	520	20	74
3.0 lb/A 2,4-D			
Rose	70	0	..
Sub	400	2	57
May 23—Full-late bloom—			
0.3 lb/A 2,4-D			
Rose	300	4	..
Sub	380	15	61
3.0 lb/A 2,4-D			
Rose	400	2	..
Sub	440	4	35
LSD (.05) between treatments	226	..	14

Cultivated Conditions

	Dry matter lb/A	Seed lb/A	% Normal germination
No 2,4-D			
Rose	2300	146	55
Sub	2200	177	44
Crimson	1400	75	84
April 17—Prebud-early bloom—			
0.3 lb/A 2,4-D			
Rose	1500	77	48
Sub	1600	110	42
Crimson	1150	36	82
3.0 lb/A 2,4-D			
Rose	400	8	32
Sub	1400	52	52
Crimson	220	2	78
May 22—Late bloom—			
0.3 lb/A 2,4-D			
Rose	2250	52	8
Sub	1700	120	50
Crimson	1130	56	27
3.0 lb/A 2,4-D			
Rose	2400	30	1
Sub	1750	60	34
Crimson	1280	62	1
LSD (.05) between treatments	396	19	6

reduced. Subclover germination remained the same as the check when the rate was 0.3 pound per acre, but was reduced somewhat at the higher rate. The only effect of spray volume—not shown in the table—was on normal germination of rose and crimson clovers. There was a definitely higher percent normal germination of these two clovers at the 0.3 pound per acre rate with 100 gallons per acre volume, than with 10 gallons per acre volume when treatment was made on May 22. This was not so at the 3.0 pounds per acre rate. The high volume appeared to be less injurious only in this case.

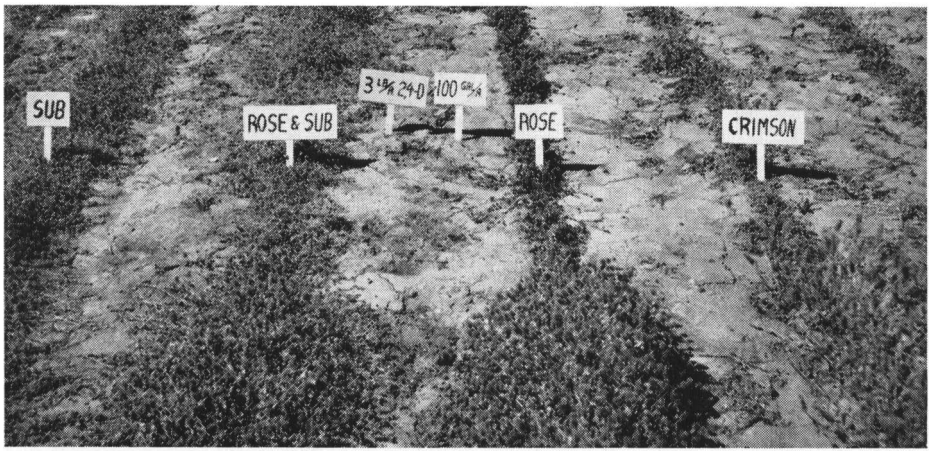
Data for the plots in which rose and subclovers were planted together—not shown in the table—indicate that subclover is even less affected by 2,4-D when it is in mixture with rose clover. For instance, the dry matter production of subclover was actually increased when in mixed stand by the low rate of 2,4-D applied on April 17. One possible explanation is that 2,4-D had a more severe effect on rose clover and, in lowering its competitive ability, allowed the increase in subclover in mixed stands. Another possibility is that rose clover offered protection for the lower-growing subclover by interception. In almost all cases subclover benefited from its association with rose clover when 2,4-D treatments were applied.

Experiments Compared

Although the dry matter yields of the clovers were considerably less in the range experiment, the relative reduction due to 2,4-D treatments was comparable in the two experiments. The first spraying of both experiments caused similar results, while the full bloom—May 23—treatment in the range experiment was slightly more injurious than the late bloom—May 22—treatment in the cultivated experiment.

Seed yield of rose clover was reduced relatively more in all treatments in this range experiment than in the cultivated experiment. Seed yields of subclover were comparable in the two experiments. The percent of normal germination was much higher for subclover from all treatments of the range experiment but this was probably due to lower natural dormancy in the seed from the range experiment.

Forage production of rose, subterranean, and crimson clovers is reduced by application of 2,4-D at early growth stages but is generally unaffected by treatment at late stages. Seed production is at a minimum with early bloom treatments and normal germination is at the lowest level with full bloom and late bloom treatments. Subclover is strikingly more tolerant to 2,4-D applied when the clovers are actively growing than are rose and crimson clovers. The effect of high spray volumes in increasing percent normal germination of seed from plants treated with a low rate of 2,4-D is also of interest, as is the enhancement of growth of subclover in mixture with rose clover after 2,4-D treatments.



Annual clovers treated with 3 lbs/A 2,4-D on April 17 in background as compared with unsprayed plants in foreground.

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Collapse in California Woods

Collapse in lumber—an extreme form of shrinkage which causes large volume loses and is accompanied by warping and splitting—is being studied in order to find ways to rehabilitate wood that has collapsed during drying and to develop a practicable technique to prevent collapse.

Some California redwood and incense cedar are prone to collapse and require careful treatment. Collapse is a major factor limiting the commercial development of California hardwoods, and also prevents application of accelerated drying techniques to these species.

To rehabilitate collapsed wood the study aims at developing principles of permanent dimension recovery by simple treatments such as steaming at the end of drying, and determining the appropriateness of the process for California woods.

Prevention studies embrace a fundamental approach to determine the mechanics and nature of collapse in wood. As a first step, the water in green collapse-susceptible wood is being replaced by organic liquids with specifically chosen properties. The analysis of the drying behavior of wood so treated enables the development of working theory and simultaneously provides leads for collapse prevention treatments. As collapse occurrence is intimately related to the relative permeability of wood, a second study—on the permeability of California woods—is partially oriented toward an understanding of collapse phenomena.

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