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Studies on the relative efficacies of a few chemical herbicides in the control of *Spergula arvensis*, L. and *Oxalis latifolia* HB&K., two important weeds of the Nilgiris

by

T. R. NARAYANAN, and D. MEENAKSHISUNDARAM,
Agricultural College and Research Institute, Coimbatore.

Introduction : *Spergula arvensis* L, commonly known as spurry and *Oxalis latifolia* HB&K, are the two major weeds of cultivated lands above 5,000 feet, on the Nilgiris. *Spergula arvensis* L, which was introduced from Europe in earlier years, is an annual, reproducing by seeds produced in abundance. *Oxalis latifolia* HB&K, a native of Mexico, has spread in many places of the Nilgiris as a troublesome weed. It is a perennial with underground bulbs, by means of which it is able to reproduce and persist in the field for a long time. These two species have now become the most predominant and pernicious of the weed population found in potato fields. Trials were conducted for the control of these weeds with chemical herbicides at the Agricultural Research Station, Nanjanad and the results are presented in this paper.

Review of Literature : Long (1938) describes *Spergula arvensis* L as one of the most troublesome weeds on light, sandy soils, where it too often occurs in overwhelming quantity. It is usually considered as typical of light soils and as an indication of the absence of lime. He states that a 5% solution of copper sulphate was fairly effective in certain experiments and that the weed in cereal crops may also be destroyed by spraying with a 7 to 10% solution of sulphuric acid. Templeman and Sexton (1946) studying the effects of synthetic plant growth-substances on seed germination and early growth of plant species, found that ethyl. β-naphthoxyacetic and 4 - methyl-phenoxy-acetic acid seriously affected (at 200 ppm) the early growth of *Ranunculus arvensis, Chenopodium album* and *Spergula arvensis.* Long and Brenchley (1949) mention that spurry will be gradually reduced by applications of lime in some form, the effect of which will be progressive and up to a point dependent upon the size of the dressing. Describing the results of spraying Agroxone at the rate of 1·5 gallons per acre containing 1·7 lb. of active MCPA on many of the common British arable and pasture weeds, Holmes (1949) puts *Spergula arvensis* L as moderately resistant, while *Oxalis* species is brought under the list of resistant weeds on which the weedicide has

no appreciable effect. Thomas and Srinivasan (1949) observed that *Spergula* was killed in two weeks by 0·2% MCPA. Templeman and Halliday (1950) using dusts and sprays of MCPA at 1, 2 and 4 lb. acid equivalents per acre on some weeds found that seedlings of a few weeds including *Spergula arvensis* were effectively controlled by a spray application of the sodium salt of MCPA at 4 lb. acid equivalent in 100 gallons per acre. Saptharishi and Azariah (1952) found that spraying 1% solution of Extar 'A', fifty days after sowing *Samai*, effected a kill of nearly 80 of the weed population, mainly of *Spergula* and that the chemical did not have any deleterious effect on the *Samai* crop, which gave a better yield of grain and straw than the untreated plots. Describing the effect of spraying weeds in the young stage with 0·1% solutions of a number of substituted-phenoxy-butyric acids as their ethanolamine salts, Wain (1954) observed that 2 : 4 - dichlorophenoxy - butyric, 4 - chlorophenoxy - butyric and 2 : 3 : 4 - trichlorophenoxy - butyric acids had only a slight effect on *Spergula* and concluded that further investigations were necessary at different stages of growth and with higher dosages of herbicide chemicals.

Though herbicides have been tried on a few species of the genus *Oxalis* by many workers, there appears to be no information on the chemical control of *Oxalis latifolia*. Winders (1948) describes *Oxalis corymbosa* as somewhat susceptible and *O. corniculata* as resistant to the hormone weedkiller 2, 4–D on weeds of New South Wales, and classifies *Oxalis cernua* and *O. corniculata* as resistant to these weedicides.

Materials and Methods: Five herbicidal treatments with the addition of a control made a six-plot layout and this was replicated four times, the treatments being randomised within each block. Each plot was 0·5 cent in area. The weedkillers were applied as sprays in a spray volume of 100 gallons per acre, using a 'Hyject' foot-operated sprayer on 13–6–1955. Spraying was done in the mornings when clear and bright weather prevailed. The plots were laid out in a fallow field in which good growth of the weeds was noticed. At the time of spraying, spurry plants had grown to a height of nearly six inches, while a few had also flowered. The following were the treatments tried on *Spergula arvensis*.

1. Control (untreated)
2. Extar 'A', @ 8 lb. per acre (Dinitro-ortho-cresol)
3. Triherbide NIX, @ 20 lb. per acre
4. Na 2, 4–D, @ 5 lb. per acre
5. MCPA (Agroxone 3), @ 5 lb. per acre
6. Na 2,4–D and MCPA, @ 5 lb. each per acre.

For *Oxalis latifolia*, the first five treatments were the same as given for spurry while the last treatment was butyl ester of 2,4–D @ 5 lb. acid equivalent per acre. Spraying was done on 14–6–1955 when the weeds were mostly in flowering phase, though young growths were also present. Teepol was used as a wetting agent in all the treatments. The effectiveness of the different treatments was assessed by taking weed counts within a 2 ft. square in each plot before spraying as well as at weekly intervals after spraying.

Observations: On spurry, Extar A and Triherbide NIX showed good scorching of foliage within 24 hours of application, while in the case of sodium 2,4–D, MCPA, and a combination of both at 5 lb. acid equivalent each per acre, slight scorching of foliage and pronounced epinasty were the effects observed in 48 hours. The mean mortality percentages obtained at weekly intervals for four weeks from the date of application of the herbicides are presented in the following table.

Mean mortality percentages of Spurry

	Treatments	Weeks I	II	III	IV
1	Control	Nil	Nil	Nil	Nil
2	Extar A, @ 8 lb. per acre	92·9	93·8	95·8	97·0
3	Triherbide NIX, @ 20 lb. per acre	99·4	100·0	100·0	100·0
4	Sodium 2,4–D, @ 5 lb. per acre	0·9	1·9	10·5	10·7
5	MCPA, @ 5 lb. per acre	12·1	13·2	75·8	96·9
6	Sodium 2,4–D and MCPA, @ 5 lb. per acre	35·9	51·8	79·1	98·3
General mean		48·3	52·1	72·2	80·6
Standard error		8·81	9·89	5·64	1·73
Critical difference, (P = 0·05)		27·14	30·40	17·38	5·31
Conclusion		3,2,6,5,4	3,2,6,5,4	3,2,6,5,4	3,6,2,5,4

In the case of *Oxalis latifolia*, observations recorded 24 hours after treatment, revealed good scorching of the leaves in the case of Extar A, Triherbide NIX and Butyl ester of 2,4–D. In the case of sodium 2,4–D and MCPA, slight scorching of the foliage and marked epinasty were the effects noticed. Mortality counts were taken a week after treatment in all the plots. These counts could not be continued further as there were regrowths in all the plots afterwards. Fresh growths were counted in all the treatments after four weeks of treatment, and the counts of fresh growths

expressed as percent over the population that existed before treatment, for statistical scrutiny. These data have thrown some light on the differential efficacies of the various herbicidal treatments in suppressing fresh growths from the underground bulbs of this weed. The data are presented in the following table.

Mortality in Oxalis latifolia

Treatments	Mean % kill a week after spraying	Mean % regrowth 4 weeks after
1. Control	Nil.	120·9
2. Extra 'A' @ 8 lb./acre	71·5	233·2
3. Triherbide NIX @ 20 lb./acre	98·7	158·5
4. Sodium 2,4-D @ 5 lb./acre	62·9	61·9
5. MCPA, @ 5 lb./acre	64·7	40·1
6. Butyl ester of 2,4-D, @ 5 lb./acre	99·1	126·7
General mean	79·6	123·6
Standard error	5·65	23·53
Critical difference (P - 0·05)	17·42	70·87
Conclusion	6, 3, 2, 5, 4	2, 3, 6, 1, 4, 5

Discussion : On *Spergula arvensis*, sodium 2,4–D at 5 lb. acre did not prove effective while the other treatments were found to be statistically equal in effect so far as the extent of kill brought about a month after spraying, is concerned. But the quickness with which the kill was effected is marked in the case of Extar A and Triherbide Nix, which destroyed the weeds to the extent of 92·% and 99·4% respectively in the first week itself and these were significantly higher than other treatments, while MCPA and a mixture of Na, 2,4–D and MCPA took four weeks to effect a kill of 96·9% and 98·3% respectively. The most effective chemical was Triherbide NIX, which gave a cent percent kill within a fortnight of applying the sprays, though later on it was on a par with Extar ' A '. Extar ' A ' and Triherbide NIX are quick in their effect because of their contact herbicidal action. Formulations of 2,4–D and MCPA, though possessing some contact action, have got to be absorbed and translocated to the different parts of the plant from the seat of application to effect a kill and hence the delayed effect. Further, the morphological features of *Spergula arvensis*, a low herbaceous annual especially the jointed, cordlike,

slender and much-branched stems with small thread-like leaves arranged in whorls, offer only a limited surface for the hormone sprays and the chances for the herbicidal spray to remain on the surface of the plant body for a sufficiently long time to get absorbed by the tissues are also limited.

The main difficulty in the control of spurry is the peculiar seeding habit of the plant. Seeds are produced in abundance and they are so minute, being lens-shaped with a winged margin that they are easily dispersed by wind. Because of this, even a field in which the weeds are killed by spraying herbicides, gets easily contaminated by wind-borne seeds of this species. This is more so in the hills, were the fields are at different levels, especially on terraced slopes. Hence complete control is possible only by using herbicides over a very wide area so as to destroy all the spurry over that tract, in the preflowering stage itself and prevent reinfestation by wind-borne seeds.

In the case of *Oxalis latifolia* which is a perennial weed, the aerial portions were killed within a week of application of Triherbide NIX at 20 lb. and butyl ester of 2,4–D at 5 lb. per acre to the extent of 98·7% and 99·1% respectively, being significantly better in effect than the other three treatments which were more or less equal in effect. The appearance of abundant regrowths in the plots sprayed with Extar A and Triherbide NIX within a month indicated that these two chemicals were effective only in killing the aerial portions by their contact herbicidal action. They are not translocated to other parts and hence fresh growths arise from the bulbs which remain unaffected, while in the case of 2,4–D and MCPA formulations, the regrowths were considerably less. This shows that these have supressed the regeneration of the weed to a certain extent. Though the hormone herbicides get translocated to various parts of the weed, they are unable to bring about a complete suppression of regrowths, because the buds in the bulbs are effectively protected by fibrous scales. Further, when once the aerial portions are destroyed the buds of the lower scales develop and give rise to short branches, each one bearing at the distal end a ' clove ' capable of developing into a new plant. Another noteworthy feature in favour of this weed is the presence of a main tuberous root which is thick and fleshy, due to accumulation of reserve food material and water and this helps in the perennating activity of the bulbs. Weeds which have reserve foodstuffs in the lower stems and roots should absorb the weed killer which should be translocated down to the roots also before kill can be assured. It is well known that 2,4–D compounds

have a variety of herbicidal actions. They kill the foliage of plants by contact, at the same time getting into the underground parts such as roots, stolons, bulbs etc., in perennial plants. It is also said to be easily by absorbed by the roots if present in the soil. Perhaps, in the control of this weed soil application of 2,4–D or a suitable soil sterilant may prove useful and a trial in this direction is worthy undertaking.

Summary: The results of trials with a few chemical herbicides on the control of two major exotic weeds of cultivated lands in the Nilgiris, namely *Spergula arvensis* and *Oxalis latifolia* are briefly outlined. Extar A at 8 lb. and Triherbide NIX at 20 lb. per acre proved definitely better in effect than others on *Spergula arvensis*. These two chemicals were also quick in their action, while MCPA at 5 lb. and a mixture of sodium 2,4–D at 5 lb. per acre proved to be ineffective against this weed.

In the case of *Oxalis latifolia*, the butyl ester of 2,4– D at 5 lb and Triherbide NIX at 20 lb. per acre proved to be the most effective in killing the aerial portions, while sodium 2,4–D and MCPA at a 5 lb. dose had a better retarding effect on the regeneration of the weeds from the underground bulbs.

The morphological features of the two weeds are also briefly discussed, with reference to the differential effects of the herbicides tried.

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