

Knowledge of Herbicides as Weed Killers to Arecanut Growers

R. B. R. YADAVA, C. K. MATHAI & K. VELLAICHAMY

Central Plantation Crops Research Institute, Regional Station, Vittal.

The problem of weed control is immense and grave and has received attention of agriculturists the world over. A weed by definition is a plant growing where it is not desired. These out of place, unwanted, non-useful, often prolific and persistent, competitive, harmful, even poisonous plants affect human welfare in more than one way. Besides reduction in crop yields, contamination by weeds impairs the quality of farm produce. They harbour insect and fungal pests which may affect crop plants. In extreme cases live-stock may be killed or at least their efficiency greatly reduced by feeding on them. Quality of cattle products may be seriously affected. Human efficiency may be reduced through allergies and poisoning. Cost of cultivation increases through labour and equipment employed to eradicate weeds. In conclusion, it can be said that the magnitude of losses due to weeds is enormous.

Raheja (1966) stated that "in most of the crops, the loss due to weeds infestation ranges from 30 to 100 per cent, and this is one of the major causes of the low yield of crops in India". The maximum benefit for yield can be achieved through better protec-

tion of crops from other pests, better crop varieties, better fertilization and irrigation practices and improved machinery, only when improved weed control is integrated. So the control of weeds is one of the important factors contributing to the success of a crop.

Various measures of weed eradication include the cultural and mechanical practices, biological methods and the chemical control. The mechanical methods though simple and widely practised in many countries involve a great deal of labour and expense and yet their effectiveness is transitory. The biological methods have very limited scope and are neither well developed nor common. The use of chemicals for weed control, on the other hand, has developed rapidly during the past two decades and herbicides are now used in controlling weeds, on a large scale.

Classification and characteristics of herbicides

Broadly the herbicides can be divided into inorganic and organic and the latter group into those containing nitrogen and no nitrogen.

Ammonium sulphamate, ammonium thiocyanate, calcium cyanamide, sodium arsenite etc., belong to the inorganic group.

The no nitrogen organic herbicides can be classified into the following groups :

1. Phenoxy-acetic acids e. g.,
 - 2, 4 - D
(2, 4 - dichlorophenoxyacetic acid)
 - 2, 4, 5 - T
(2, 4, 5 - trichlorophenoxyacetic acid)
 - MCPA (4 - chloro -
2 - methylphenoxyacetic acid)
2. Phenoxypropionic acids e. g.,
 - Silvex or Fenoprop (2 - (2, 4, 5 -
trichlorophenoxypropionic acid)
3. Phenoxybutyric acids e. g.,
 - MCPB (a - (4 - chloro - 2 -
methylphenoxy) butyric acid.
 - 2, 4, - DB 4 -
(2, 4 - dichlorophenoxy) butyric acid.
4. Phenoxyethyl (X) e. g.,
 - Sesone (2, 4, dichlorophenoxyethyl
hydrogen sulphate)
5. Phenylacetic acids e. g.,
 - Amiben (3, amino - 2,
5 - dichlorobenzoic acid)
6. Halogenated aliphatic acids e. g.,
 - TCA (Trichloroacetic acid)
 - Dalapon (2, 2 - dichloropropionic acid)

The nitrogen containing organic herbicides include the following groups.

1. Amides e. g.,
 - CDDA (2 - chloro - N,
N - diallylacetamide)
 - Stam 34 (N -
(3, 4 - dichlorophenyl) propionamide

MH (1, 2, 3, 6 - tetrahydro - 3,
6 - dioxypyridazine)

2. Ureas e. g.,
 - Fenuron
(NN - dimethyl - N' - phenylurea)
 - Monuron (N' - (4 - chlorophenyl) -
NN - dimethylurea)
3. Carbamates (Urethanes) e. g.,
 - Propham or IPC
(Isopropyl - N - phenylcarbamata)
 - Barban (4, chlorobut - 2 - ynyl
N - (3 - chlorophenyl) carbamate)
4. Thiocarbamates e. g.,
 - EPTC (S - ethyl
NN - dipropylthiocarbamate)
5. CDEC (2 - chloroallyl
NN - diethyl - dithiocarbamate)
6. Triazines e. g.,
 - Simazine (2 - chloro - 4,
6 - bisethylamino - 1, 3, 5, triazine)
 - Atrazine (2 - chloro - 4 - ethylamino -
6 - isopropylamino - 1, 3, 5 - triazine)
7. Substituted phenols e. g.,
 - DNOC (2 - methyl - 4, 6 - dinitrophenol)
 - PCP (Pentachlorophenol)
8. Bipyridylum Quarternary salts e. g ,
 - Diquat (9, 10 - dihydro - 8a,
10a - diazoniaphenanthrene - 2A)
 - Paraquat (1, 1' - dimethyl - 4 - ,
4' - bipyridylum - 2A)
9. Toluidines e. g ,
 - Amitrole (3 - amino - 1, 2, 4 - triazole)
 - Endothal (7 - oxabicyclo (2, 2, 1)
heptane - 2, 3 - dicarboxylic acid)

The popularity of the herbicides is due to the following reasons :

- (i) - they are selective,
- (ii) - they are effective in low dosages,
- (iii) - they are relatively non-toxic to man and animals, and
- (iv) - they are non-corrosive to appliances.

Herbicidal treatments are generally administered at pre-planting, pre-emergence or post-emergence stages. In the pre-planting type of treatment herbicides are applied to the soil before the crop is sown. These herbicides kill the germinated weeds and also prevent further germination. The pre-emergence herbicides are applied after planting the crop in the field. Here, weed seeds germinating prior to crop seeds are killed. A residual effect is also obtained. In the post-emergence application, the herbicide is applied to the field when crop and weeds are well established. The weeds are killed without or with negligible injury to the crop.

Work done in arecanut

During the year 1962-1964, some weedicides trial in the areca gardens conducted at the Regional Arecanut Research Station, Hirehalli, Mysore State indicated that Dowpon had very good effect in killing almost all types of grasses except *Cyperus rotundus*. Many pernicious types like *Agropyron repense* showed complete drying up of all the exposed portion and suppression of growth. New shoots formed were also pale and deformed. However, after 5-6 months, fresh healthy shoots appeared but, it was controlled by a second spraying. In general 3-4 sprayings at equal intervals may be needed to eradicate such pernicious grasses. The weeds of compositae and leguminosae families were highly susceptible to 2, 4-D and 2, 4, 5-T herbicides. Pentachloro pheno₁ (PCP) did not have any effect on grasses but showed some promising effect on many of

the dicots. Paraquat (Gramaxone) and simazine were very effective to control the monocot and dicot weeds. A combination of 1 per cent Dowpon with 0.5 per cent of 2, 4-D (amine salt) appears to be of good utility for controlling the weeds in the older arecanut gardens. However the cumulative effect of the herbicides on the arecanut trees remains to be studied.

How herbicides work

The herbicidal hormones as weed killers do not destroy the cells directly with which they come in contact. The killing appears to be largely indirect and results in part from depletion of food due to a marked acceleration of respiration, a great acceleration of cell enlargement of cortical parenchyma of stems and roots as well as leafy parenchyma, an inhibition of transport from the leaves, a rupture of the phloem tissue resulting from excess development of parenchyma in the phloem region, and an inhibition of bud development. The herbicide is transported to all parts of the plant, bringing about these changes which commonly result in death of the entire plant.

The type of weed control to be adopted will depend upon the local conditions. When labour is scarce and expensive and weed growth very active, it will pay to adopt a largely chemical form of weed control and these chemicals may offer a great potential for speedy increase in the yield by preventing the several losses caused by weeds.

Acknowledgement

The authors express sincere thanks to Shri K. Shama Bhat, Arecanut Specialist, Central Plantation Crops Research Institute, Regional Station, Vittal for his valuable suggestions and critically examining the manuscript.