

Reference 20 Safe and correct use of herbicides

Summary

Farmers' knowledge regarding safety, application techniques, timing and dosage of herbicides use is often inadequate. As a result, the effectiveness of herbicides is often low, resulting in persistent weed growth, health problems for farmers and environmental pollution. This reference gives guidelines on safe and well-informed use of herbicides. Many integrated weed management options other than herbicide use are available to farmers and, as much as possible, these options should be promoted or combined with herbicides to reduce farmers' reliance on herbicides.

If not correctly used, herbicides may be dangerous to the health of the farmer, his or her crops, and the environment as a whole. Chemical control should be the last resort in the range of integrated weed management options (Reference 19). It should be stressed that herbicides are poisons that may be harmful to health, the crop and the environment if not used properly.

Farmers may not appreciate the importance of a number of factors that influence the efficacy of herbicides. To increase the efficacy and safe use of herbicides, farmers can often improve on one or more of the following seven points:

- Choice of product.
- Timing of the treatment.
- Water management.
- Equipment inspection and maintenance.
- Calculation of dose to apply.
- Application techniques.
- Safety.

Choice of product

There are different groups of herbicides:

- Selective herbicides: these herbicides affect certain weed species, but not others. When used as indicated, they will control susceptible weeds without damaging the crop for which they are recommended. They are usually specific to certain types of weeds (products against grasses, sedges or broad-leaved weeds).
- Non-selective herbicides kill a large range of species. They must therefore be applied under certain conditions to avoid damaging the crop, e.g. Gramoxone (paraquat) or Roundup (glyphosate).

Selective and non-selective herbicides can work either as contact or systemic herbicides:

- Contact herbicides kill parts of the plant that the product comes into direct contact with when applied. They are not very efficient against perennial weeds whose underground parts are not reached by the product.

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- Systemic herbicides enter the plant and can, therefore, reach and affect all organs. Such herbicides, although efficient against annual plants, are most useful for the control of perennial species, such as wild rice (with rhizomes), and perennial grasses and sedges.

It is important to choose the herbicide suited to the weeds in the field and also those that are recommended for lowland rice cropping.

It is important to follow the directions that are usually printed on the label of the container — FOLLOW THE MANUFACTURER’S INSTRUCTIONS.

Two names are printed on a herbicide container: the *commercial* name, e.g. ‘Stam,’ ‘Herbextra,’ or ‘Basagran,’ and the *common chemical name of the active compound*, e.g. propanil, 2,4-D, bentazone. Commercialized products may also contain two chemical compounds: for example, ‘Rical’ contains propanil and thiobencarb.

Weeds can be classified into three groups (*see* Reference 18): grasses (Gramineae), sedges (Cyperaceae), and broad-leaved weeds.

Grasses (Gramineae)

One of the most widely-used active compounds against grasses is propanil, which can be found in ‘Tamariz,’ ‘Rical’ and ‘Garil.’

Sedges (Cyperaceae)

Active compounds effective against sedges include 2,4-D and bentazone, which can be found in ‘Herbextra’ and ‘Basagran.’

Broad-leaved weeds

There are several active compounds that are used against broad-leaved weeds, for example 2,4-D, which can be found in ‘Herbextra,’ ‘Herbazol’ and ‘Calliherbe.’

Treat at the appropriate time

Weeds cause most damage within the first six weeks after sowing or transplanting. Contact herbicides are most efficient when weeds are very young (2 to 3 leaves). This is very important for grasses and sedges. If the treatment is applied late, more damage is done to the rice crop and the herbicide is usually less efficient.

Do not forget the water!

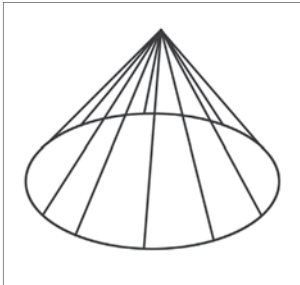
For many herbicides (but not all), the field should be drained 24 hours (1 day) before application and re-flooded 2 to 3 days after treatment to prevent new weeds from germinating. However, some compounds—such as Londax or Ronstar 12L—should be applied in flooded fields.

Sprayer nozzle

Two nozzles are commonly used: cone nozzles that produce a circular shower of droplets (they are to be used with insecticides) and fan or flood nozzles produce bigger drops and are suitable for herbicides. Cone nozzles should be used with higher pressure settings and fan nozzles should be used with lower pressure settings.

Nozzles are usually made of plastic and are easily damaged. Before beginning the treatment, the condition of the nozzle should be checked: fill the sprayer half full with water and test the nozzle by spraying water onto a dry surface. A nozzle in good working condition will produce a uniform shower; if it does not, change the nozzle. Nozzles wear out rapidly and should be changed regularly.

Cone nozzle (*insecticides*)



Fan/floodjet nozzle (*herbicides*)

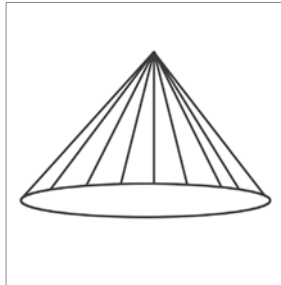
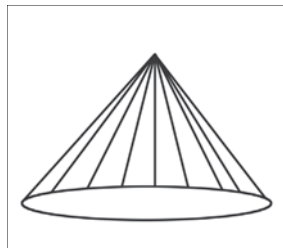


Figure 20.1. Different nozzle types

Nozzle in good condition



Nozzle in bad condition

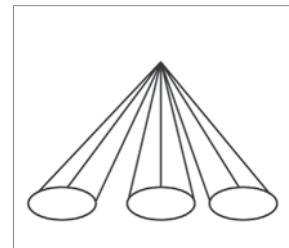


Figure 20.2. Example of the effect of nozzles in good and bad working condition on the application of herbicides

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Dosage

Calculating what dosage to apply is often a problem for rice-growers and for extension agents. We have tried to simplify calculations by calculating the number of sprayers per hectare to apply and by using a measuring unit that is easy to find in most West African markets: the small tomato can containing 50 to 60 ml of tomato paste. Experience has shown that to spray one hectare with a nozzle in good working condition and a 15 liter sprayer, one will need 300 liters of solution, i.e. 20 sprayer-loads.

Note: calculations will have to be adapted if sprayer content is not 15 liters or if fewer or more than 20 sprayer fills are required per hectare.

If the field's surface area is known, it is possible to calculate whether the application has been correctly done. For example, when a farmer treats a field of one-quarter of a hectare with 5 sprayer tanks, it means that he/she walked at the intended speed. If he/she walks slower, he/she will use more and if he/she walked faster he/she will use less.

The small tomato can

To control sedges and broad-leaved weeds, 1 liter of 2,4-D should be applied per hectare. This dosage corresponds to one little tomato can of a herbicide containing 2,4-D (e.g. Herbazol) per 15-liter sprayer.

i.e. 1 liter = 1000 ml

20 sprayers (15 L each) per ha

$1000 \text{ ml} / 20 = 50$

i.e. 50 ml (1 small tomato can) per sprayer

To control grasses, 5 liters of propanil should be applied per hectare.

This dosage corresponds to 5 small tomato cans of a herbicide containing propanil (e.g. Garil) per 15-liter sprayer.

Take care! These calculations are valid only when the sprayer's capacity is 15 liters, and the application rate is 300 L/ha, otherwise they must be adapted.

Use the right application techniques

Using the right application techniques will result in the uniform application of herbicide and facilitate good weed control. If treatments are not applied uniformly, some areas will be correctly treated or receive an over-dose, and others will receive an under-dose or no treatment.

Half fill the sprayer container/tank with water and test the width and evenness of the spray on bare soil away from the field. Check the nozzle and change it if the spray is not evenly distributed. Move the

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sprayer arm up and down and observe how it modifies shower width. If the hose is lowered, its width decreases, whereas when it is raised, the surface area treated increases. It is usually recommended to spray from 0.7 m height. When spraying, the height of the nozzle above the ground should be kept constant.

When the sprayer is half full with water, add the herbicide using the small tomato can as a measure. Rinse the can with clear water and pour its contents into the sprayer. Put the lid back onto the sprayer and shake it. Fill the sprayer tank up with water and shake again.

Once again outside the field, test the sprayer for 5 seconds, to check that the hose is filled with the solution. Start treating the field, keeping the sprayer arm at a constant height. Pump slowly and regularly, i.e. once every two steps.

Walk with regular, even strides. Less of the herbicide will touch the weeds if one walks too fast. Too much is applied if one walks too slow. The right speed is about 60 m per minute.

The field should be treated completely. If rice has been planted in lines, they will be used as guiding marks; if not, one's own steps can be followed or guide posts can be placed at regular intervals.

After treating, the sprayer and other equipment should be carefully cleaned with clean water. Hands and clothes should be washed too.

DO	DO NOT
<ul style="list-style-type: none">• Use the appropriate herbicide.• Treat early when weeds are small.• Check that the nozzle works properly.• Remember to flood the field 2 to 3 days after treating.• Follow the manufacturer's recommendations on the label.	<ul style="list-style-type: none">• Treat when it is windy, when rain threatens or immediately after rain.• Walk in the field at random waving the sprayer arm around while treating.• Contaminate waterways and drains with herbicides.

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Safety rules to be respected

Beware of herbicides: they are poisonous!

- Do not let children handle herbicides or their containers.
- Keep children away from the field while treating.
- Wear gloves, glasses and a mask while treating.
- Wash carefully with soap after touching the herbicide bottle and after treating.
- Clean clothes and equipment with soap.
- Never eat, drink, smoke, or touch mouth or eyes while handling herbicides.
- If the solution enters the eyes, rinse with lots of water and go as quickly as possible to the nearest health center (clinic).
- Always follow the manufacturer's recommendations.
- Dispose of empty containers carefully.



Figure 20.3. Use gloves, a mask and glasses during herbicide spraying. Wash your body, the equipment and clothes with soap after using herbicides

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Table 20.1. Herbicides used for weed control in inland-valley rice and guidelines for application

Names	Active ingredients (g/L)	Target weeds	Stages	Dosage (L/ha)	When to apply	Observations
Propanil Stam F 34 Surcopur	Propanil: 360	Grasses and some broadleaved weeds	2–3 leaf stage of weeds	5 to 8	After drainage	Contact herbicide
Weedone TP	2,4-D: 480	Broad leaves and sedges	2–3 leaf stage of weeds	1 to 1.5	After drainage	Contact herbicide
Basagran PL2	Bentazon: 140 Propanil: 360	Broad leaves and sedges	2–3 leaf stage of weeds	6 to 8	After drainage	Contact herbicide
Garil	Triclopyr: 72 Propanil: 60	Grasses, sedges and some broad-leaved weeds	2–3 leaf stage of weeds	5	After drainage	Contact herbicide
Ronstar 12 L	Oxadiazon: 120	Grasses, sedges and broad-leaved weeds	Before emergence of rice and weeds	6	Apply on water layer, three days after sowing or transplanting	Contact herbicide
Ronstar PL	Oxadiazon: 120 Propanil: 360	Grasses, sedges and broad-leaved weeds	After emergence of rice and weeds	5	After drainage	Contact herbicide
Ronstar 25 EC	Oxadiazon: 120	Grasses, sedges and some broad-leaved weeds	Before emergence of rice and weeds	4	Apply on moist soil	Pre-emergence herbicide
Londax	Bensulphuronmethyl	Sedges and broad-leaved weeds	2–5 leaf stage of weeds	80 g/ha	Applied to the floodwater	Apply using a bottle