

Weed control

Table 2. Pre-planting herbicides used to treat maize cropfields against *Cyperus rotundus*.

Active ingredient	Commercial name	Concentration (g/l)	Manufacturer	Dose active ingredient (g/ha)	Dose commercial product (l/ha)
vernolate (+ protector)	Surpass	480	Stauffer	3 360	7
EPTC	Capsolane	360	La Quinoléine	3 600	10

Table 3. Selective post-emergence herbicides that are efficient in controlling *Cyperus rotundus*.

Crop	Active ingredient	Commercial name	Concentration (g/l)	Manufacturer	Dose active ingredient (g/ha)	Dose commercial product (l/ha)
Rice	2,4-D	many formulations	720	-	1 440	2
	bentazone + propanil	Basagran PL2	+ 340	BASF	960 + 2 040	6
	triclopyr + propanil	Garil	+ 360	Dow Elanco	360 + 1 800	5
	triclopyr 2,4-D	Turflon	+ 240	Dow Elanco	240 + 480	2
Maize	bentazone dichlorprop	Basagran DP	260 + 340	BASF	520 + 680	2
	fluroxypyr	Starane	200	Dow Elanco	300	1.5
Sugarcane	ioxynil + 2,4-D	ActrilDS	100 + 600	Rhône-Poulenc	150 + 900	1.5

Non-selective herbicides: instructions for use

■ Systemic products

Systemic products, which are transported through plants by the sap, are quite slow-acting. It is therefore very important not to disturb the treated weed population (e.g. by mechanical interventions or weeding) for at least 15 days.

■ Glyphosate, glufosinate, sulfosate

In addition, glyphosate, glufosinate and sulfosate only penetrate the leaves, and have no residual effect. It is therefore possible to plant a crop as early as the day after the herbicide application, except in extremely sandy soils where the product can dissolve in the soil solution and destroy the young seedlings at germination.

■ Imazapyr

Imazapyr, in contrast, penetrates both the leaves and roots and remains persistent in the soil. It is essential to delay cropping after applications with this product. The length of this delay will depend on soil conditions, climate and cropping practices, but can be as long as several months.

■ Adding a surfactant

For glyphosate, adding a surfactant improves penetration of the product through the leaf cuticles, thus lowering the application dose.

■ Splitting the dose

Splitting the dose, and conducting two applications with an interval of about 10 days, will destroy *C. rotundus* plants that were not very developed during the first treatment.

Commelina benghalensis

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A major weed of intensively cropped cotton fields

Commelina benghalensis is an annual weed species that develops in extended clumps, with ascending shoots at the tips. The thick cylindrical

stems bear oval-lanceolate leaves with red hairs on the margins of the false petiole. The pale-blue aerial flowers are arranged in groups of three or four in triangular foliated spathes. The white underground stems bear underground flowers which do not open. Seeds are thus produced both underground and aboveground.

Botanical name:

Commelina benghalensis L.

Family: Commelinaceae

Class: Monocotyledons

Distribution: humid tropical regions

International code: COMBE

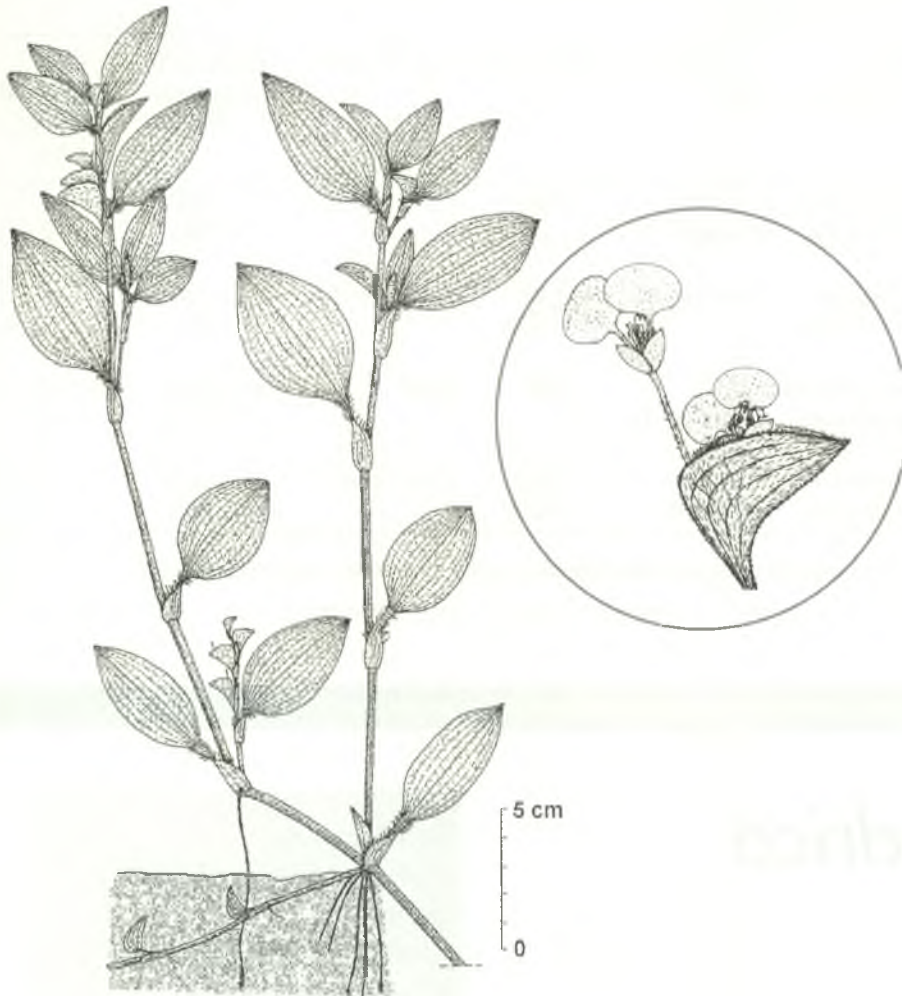
Sexual propagation:

aerial and underground seeds

Vegetative propagation:

cuttings, layering.

C. benghalensis has high vegetative propagation potential via layering or branch cuttings.



Germination initially occurs 15 days after the first abundant rains, but few seeds germinate until tilling. Massive germination, lasting 4-5 weeks, then takes place. Very little emergence occurs thereafter in unweeded plots. However, any working of the soil (weeding, earthing-up, etc.) will provoke massive growth of new seedlings.

C. benghalensis is a highly ubiquitous, nitrophilous species that is widely distributed throughout the tropics and subtropics. It mainly grows on sandy alluvium and well-structured ferruginous soils. It is generally not found in degraded soils (> 85% sand) or soils with a high clay content (> 55% clay). It is most abundant in regions where annual rainfall levels are above 1 000 mm.

This species, considered as a major and widespread weed in northern Cameroon, is also very abundant in the southern half of Burkina Faso, in northern Benin and the Central African Republic.

C. benghalensis is generally absent on fallow land, but appears after 3-4 years of cultivation. With intensive cropping, its density increases from year to year, reaching a total infestation level after 10-15 years. Some crop-intensification factors promote the selection of this species. This is an important phenomenon under cotton cropping conditions involving tillage just before sowing, along with heavy fertilizer applications. It is a particularly troublesome species for

mechanical weeding since it grows again rapidly from cuttings left in the soil. In addition, pre-emergence herbicides currently used to treat cotton cropfields (diuron, dipropetryn, metolachlor) have little effect on *C. benghalensis*. Their repeated use accentuates infestation by this weed.

Integrated weed control: a necessity

Given the ecology and biology of *C. benghalensis*, various elements of the cropping system, i.e. rotation crops, soil preparation, cropping schedule and weeding techniques, should be integrated in strategies to control this weed.

All soil working will promote germination of *C. benghalensis*. Two types of soil preparation and crop planting techniques are possible.

● Early direct sowing

It is possible after all weeds are destroyed with a non-selective herbicide. Treatment with a pre-emergence herbicide (crop-specific) at sowing will keep the plot clear until it is earthed up.

● Early tillage

It is possible 4 to 5 weeks before sowing to induce germination of *C. benghalensis*. The young seedlings are then destroyed with a non-selective herbicide (paraquat-type) at sowing. A pre-emergence herbicide treatment can then be conducted at sowing to keep the plot clear until it is earthed up. This latter procedure is very effective in cases of massive weed infestation in the field.

Early manual weeding of *C. benghalensis* is essential, and will get rid of all young seedlings (smaller than 10 cm). However, for more developed plants, all underground stems likely to produce underground seeds must be earthed up. After hoeing, all of these weeds have to be removed from the field since this species

shows high resistance to drying out — otherwise reinfestation will occur from the weeded swaths.

Promising herbicides

Atrazine, presently used widely in northern Cameroon to treat maize cropfields, shows some efficacy. Cropping maize, in atrazine-treated fields, in rotation with cotton is therefore of considerable interest.

This type of crop rotation could be of even further interest if experiments in maize cropfields, now under way in tropical regions, confirm the excellent behaviour of new pre-emergence herbicide products (Table 1) against *C. benghalensis*, particularly in association with atrazine.

Table 1. Examples of new pre-emergence herbicide products presently being tested in maize cropfields.

Active ingredient	Commercial name	Concentration (g/l)	Manufacturer	Dose active ingredient (g/ha)	Dose commercial product (l/ha)
acetochlor + atrazine	JF 12112 + atrazine (1)	768	ICI	1 000 + 1000	1.3 + 2
aclonifen + atrazine	Challenge M	250 + 250	Rhône-Poulenc	1 000 + 1 000	4
metazachlor + atrazine	Pree + atrazine (1)	400	BASF	600 to 800 + 1 000	1.5 to 2 + 2
metolachlor + atrazine	Primagram (reference)	250 + 250	Ciba-Geigy	1 000 + 1 000	4

(1): many extemporaneously-mixed atrazine formulation are being tested.

Imperata cylindrica

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Botanical name:
Imperata cylindrica (L) Palisot
de Beauvois
Family: *Poaceae*
Class: Monocotyledons
Distribution: humid tropical regions
International code: IMPCA
Vegetative propagation: rhizomes

An aggressive weed

Imperata cylindrica (L.) P. Beauv. develops in tufts of ribbon-like, upright leaves with pointed apices. The rigid, cylindrical stem bears a spiciform, downy inflorescence, silvery-white in colour.

I. cylindrica is a perennial species that mainly multiplies vegetatively by extension of a vigorous rhizome system. As an alternative means of propagation, its seeds can also be dispersed widely by the wind. Fires, cutting and grazing induce regrowth and

stimulate flowering. Rhizomes can penetrate to 120 cm depth in the soil.

I. cylindrica, widely distributed in tropical regions, is very abundant in humid savanna regions (Sudano-Guinean). This sun-loving species mainly grows as a weed in cropfields or as a ruderal plant along roadsides and in open spaces. It has no special soil preferences. Its field expansion is highly favoured by soil working (tilling, weeding, earthing-up). In particular, disk ploughing in rainy periods enhances propagation of this weed.

A difficult species to control

Regardless of the weeding method used, control of *I. cylindrica* populations must be done as soon as the first plants appear, through focused spot treatments. Heavy overall treatments are necessary if the operations are carried out once the population is well established. After weeding of *I. cylindrica*, the land must be cultivated immediately to enable the crop cover to compete with any weed plants that were not destroyed.