

THE USE OF ROUNDUP IN ROUNDUP READY® MAIZE AND SOYBEANS

Background

Monsanto currently license the use of their GMO ROUNDUP READY PLUS® (L 7966) technology to Pannar. This technology allows for the safe use of the herbicide ROUNDUP READY PLUS® in crops containing the ROUNDUP READY® gene. Breeders incorporate the ROUNDUP READY® gene into Pannar's maize and soybeans. ROUNDUP READY® crops are always designated with the letter R behind their hybrid or cultivar name: PAN 6238R and PAN 535R are examples of crops containing the ROUNDUP READY® gene while PAN 6114 and PAN 626 are examples of crops that do not contain the ROUNDUP READY® gene and may die if ROUNDUP® is sprayed on them.

Roundup Registrations

Currently there are three different registrations for glyphosate-containing herbicides produced by Monsanto. ROUNDUP® is the trade name registered by Monsanto for the chemical known as glyphosate. Only ROUNDUP READY PLUS® (L 7966) is registered for use in ROUNDUP READY® crops.

Trade Name & Registration No. Act 36/1947	Formulation	Application	Rainfastness	Description
Roundup (L0407)	3 6 0 g / l glyphosate in IPA salt	2–2.5l	2 hours	A soluble concentration, non-selective, systemic post emergence herbicide with little or no soil activity for the control of perennial and annual weeds in agricultural, non-crop and industrial areas. ROUNDUP can be used as a growth regulator to increase sucrose content of sugar cane or reduce growth of weeds.
Roundup Ready Plus (L7966)	5 4 0 g / l glyphosate in potassium salt	1.3–1.7l (Total may not exceed 3.4l in a season)	1 hour	A soluble concentrate non-selective post emergence herbicide for the control of annual and perennial weeds in ROUNDUP READY® maize, cotton and soybean varieties.
Roundup Turbo (L7166)	4 5 0 g / l glyphosate in IPA salt	0.8 - 4l	2 hours	A water soluble non-selective post emergence herbicide containing TranSorb surfactant for the control of annual and perennial weeds in agricultural, non-crop, conservation and industrial areas.

Roundup Ready Plus

ATTENTION: MONSANTO RECOMMENDS THIS PRODUCT ONLY FOR POST EMERGENT USE OVER-THE-TOP OF OR DIRECTED ONTO IMPROVED MAIZE, COTTON AND SOYBEAN VARIETIES THAT ARE DESIGNATED AS CONTAINING THE ROUNDUP READY GENE. SEVERE INJURY OR DEATH OF MAIZE, COTTON AND SOYBEAN WILL RESULT IF ANY HYBRIDS OR VARIETIES NOT PROPERLY DESIGNATED AS HAVING THE ROUNDUP READY GENE ARE SPRAYED WITH THIS PRODUCT.

General Information

- The herbicidal action is only visible after 4 days onwards for annual weeds and 7 days for perennial weeds after application (depending on growing conditions, weed growth stage and cultural conditions).
- Apply ROUNDUP READY PLUS post-emergence to actively growing weeds, directed on the foliage.
- Do NOT spray whilst weeds are wet, dormant or under stress nor when covered in a layer of dust or damaged by frost.
- Heavy rainfall or irrigation shortly after application may reduce efficacy and a repeat application may be necessary. ROUNDUP READY PLUS is rainfast within one hour after application.
- There are no rotational crop restrictions due to herbicide activity following applications of this product.

Mixing Instructions

Note: Always use clean, good quality water for mixing and spraying.

- ROUNDUP READY PLUS mixes readily with water.
- Spray water pH must be in the range of 4.5 to 6.5. Add a buffering agent if necessary (e.g. Bladbuff.).
- Sequence of tank mixing: add the ammonium sulphate to the spray water; add the ROUNDUP READY PLUS followed by the recommended tank mix product.
- Agitate the spray solution while mixing and spraying.
- Clean sprayer parts immediately after using this product by thoroughly flushing with water.
- ROUNDUP READY PLUS can be tank mixed and sprayed with certain EC and SL formulations. Do a small-scale test mix to confirm compatibility before doing a large-scale application. Adhere to all label recommendations.
- For the control of *Commelina benghalensis* (wandering Jew), *Convolvulus arvensis* (field bind weed), *Ipomoea purpurea* (morning glory) and *Portulaca oleracea* (common purslane) in ROUNDUP READY MAIZE ONLY, ROUNDUP READY PLUS can be mixed with either 2,4-D amine or MCPA at recommended rates.
- Do not use a buffering agent when tank mixing with either 2,4-D amine or MCPA.
- Do not mix with SC insecticide formulations.

SPRAY SOLUTION FOR HAND-HELD KNAPSACK SPRAYERS:

Specifically for spot spraying of weeds.

Desired Water Volume	2,0 % spray solution
5 l	100 ml
10 l	200 ml
20 l	400 ml

Application Information

- Tractor mounted or towed sprayers: ROUNDUP READY PLUS herbicide must be applied in a maximum water volume of 125 l/ha. Ensure an even droplet distribution on the target leaf surfaces. Avoid spraying to the point of run-off from the target leaf surfaces. (At volumes of under 125 l/ha, run off should not be a concern).
- Ensure that spray equipment is clean and free of rust, dust and sediment from other pesticides before spraying.
- Always use clean water. Avoid the use of brack or muddy water, or water with a high colloid content derived from soils high in organic matter. Where alkaline and/or hard water occurs, a buffer e.g. Bladbuff 5 should be added according to label recommendations. Analysis of the water source is advisable to determine the level of the sodium, calcium and magnesium cations, as well as the carbonate and bicarbonate fractions as pH is not necessarily a good indicator of whether antagonism will be experienced between the herbicide and the water carrier.
- Add 2 % ammonium sulphate to the spray water before adding ROUNDUP READY PLUS herbicide.
- Correctly calibrate all sprayers under field conditions.
- It is recommended to use low pressures of 100 to 150 kPa with the appropriate nozzles to deliver the required water volume and dosage rate per ha.
- Do not spray when wind speed exceeds 10 km/h.
- Ensure a fine, even droplet distribution and thorough coverage without runoff from the target weeds.

ROUNDUP READY MAIZE

1. Broadcast Application

Broadcast (over the top) application of ROUNDUP READY PLUS herbicide can ONLY BE APPLIED FROM THE GROUND CRACKING STAGE UP TO THE V8 STAGE. THIS STAGE IS REACHED WHEN THE FIRST PLANTS IN THE FIELD HAVE 8 LEAVES WITH CLOSED COLLARS AROUND THE MAIN STEM. The actual number of leaves may be more. Do not make broadcast applications if mechanical crop damage due to the passing of the spray rig will occur. BROADCAST APPLICATION AFTER V8 STAGE MAY RESULT IN YIELD LOSS OR DELAYED MATURITY. For best results use flat fan or twin jet nozzles that are suitable for low water volume deliveries. Where sequential applications are necessary to control specific weed species

(e.g. *Cyperus esculentus*), the second application should not occur within 10 days of the first application. If by this time the maize is beyond the V8 stage, a post directed (see below) application will be necessary.

2. Directed application

Directed ROUNDUP READY PLUS herbicide applications can be made after the V8 stage, where row spacing permits the passage of the application equipment without causing mechanical damage to the maize crop. Row spacings of 150 cm and 210 cm will probably work best for conventional tractor mounted spray rigs.

For the control of certain broadleaf weeds mentioned above, ROUNDUP READY PLUS can be mixed with either 2,4-D amine or MCPA at recommended rates.

See recommendations under “Application dosages”.

ROUNDUP READY SOYBEAN

Broadcast Application

This product may be applied post-emergent to ROUNDUP READY Soybeans from the ground cracking stage throughout to flowering. Allow a minimum of 14 days between application and the harvest of soybeans.

Maximum allowable ROUNDUP READY PLUS application volumes:

- Combined total per season for all applications 6.7 l/ha
- Pre-plant, Pre-emergent applications 2.0 l/ha
- Total in-crop applications from cracking throughout to flowering 4.7 l/ha
- Maximum pre harvest application rate 1.3 l/ha

See recommendations under “Application dosages”.

Withholding periods

Allow the following number of days between last application and harvest:

Maize - Grazing 28 days

Green Mealies - 42 days

Soybeans – 14 days

APPLICATION DOSAGES

Weed spectrums in maize, cotton and soybean are variable and differ by region, soil type and climatic factors that change from season to season. This results in a varied and uneven emergence of a variety of weed species at any one site where one or more species may dominate. In order to compensate for this fact the dosages recommended are aimed at covering a broad spectrum of weeds provided they are sprayed before weeds with an upright growth form reach 100 mm in height (e.g. khaki weed) or weeds with a flat growth form reach the 6 - 8 leaf stage (e.g. common purslane).

DOSAGE RATES

A. Annual grasses and broad leaf weeds:

1.3 l/ha Applied before 100 mm in height or the 8 leaf stage.

1.7 l/ha Applied between 100 and 200 mm or up to the 12 leaf stage.

B. Species requiring a follow-up spray and/or increased rate:

Commelina benghalensis - Wandering Jew

1.7 l/ha Apply at the three-leaf stage followed by

1.7 l/ha (apply 10 - 20 days later).

Ipomoea purpurea - Morning glory

1.7 l/ha Apply at the 4 - 5 leaf stage followed by

1.7 l/ha (apply 10 - 20 days later).

Portulaca oleracea - Common purslane

1.7 l/ha Apply before flowering.

Tribulus terrestris - Devil's thorn

1.7 l/ha Apply before first flowers appear.

C. Biennial and Perennial weed species:

1.7 l/ha Apply before 100 mm in height or the 8 leaf growth stage.

Cyperus esculentus - yellow nut sedge 1.7 l/ha

Apply at the three to four leaf stage follow by 1.7 l/ha (apply 10 - 20 days later).

The following weed species will not be controlled at these recommended rates (but may be controlled at higher dosage rates):

Cynodon dactylon - common quick grass (see below)

Convolvulus arvensis - field bind weed

Oenothera stricta - evening primrose

Panicum maximum - common buffalo grass

Paspalum spp. - common paspalum.

Cynodon dactylon (common quick grass) control:

Spray the plants with Roundup or Roundup Turbo at the recommended rate prior to any cultivation shortly before planting the crop. Apply in-crop sprays as for *Cyperus esculentus* (yellow nut sedge) recommended above. A late season spot spray when the crop is mature and drying off is also recommended.

ADDITIONAL INFORMATION AND TANK MIX COMBINATIONS

1. Pre-Plant, Pre-Plant Incorporated, Pre-Emergent and Post-Emergent treatments

Soybean

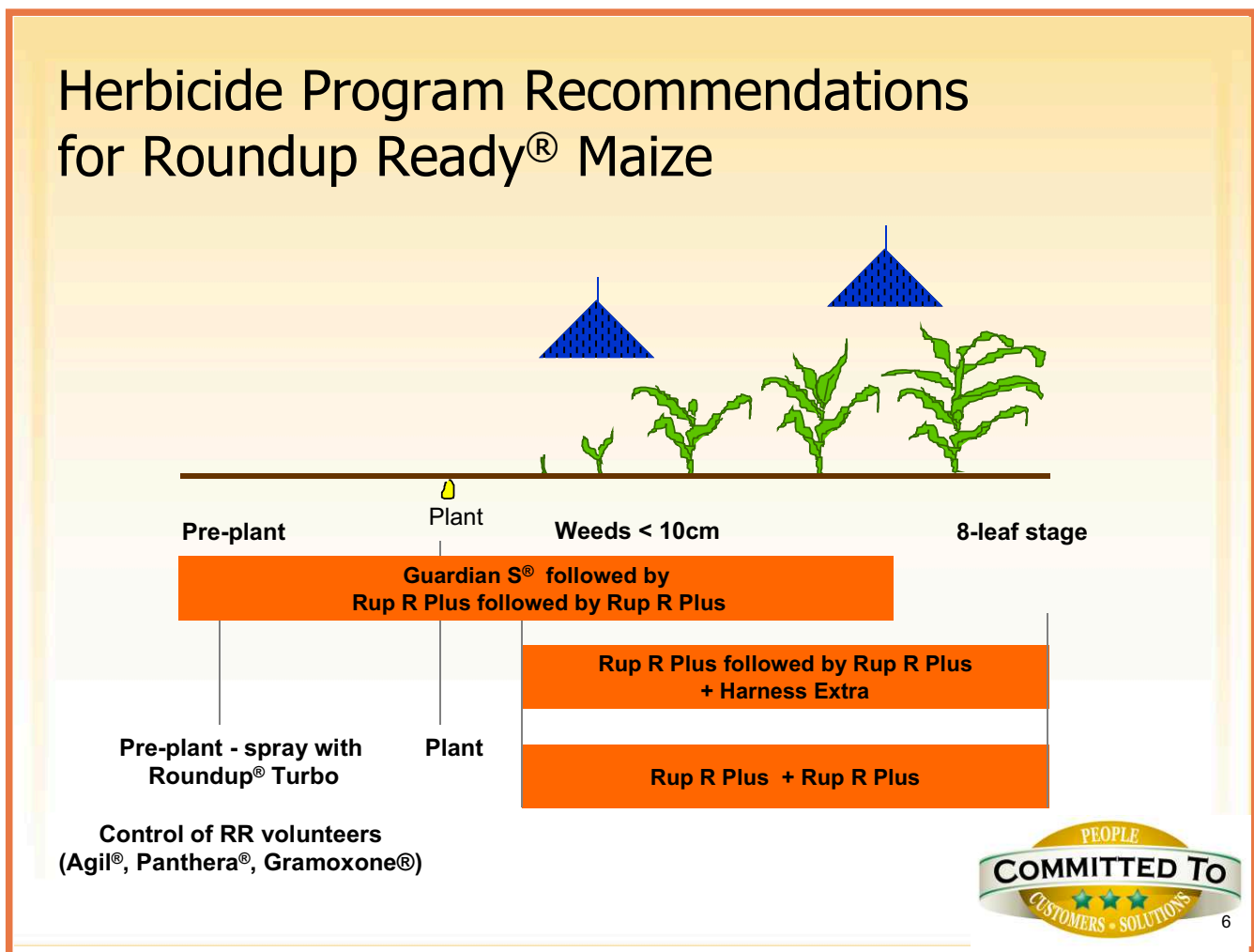
The above recommended ROUNDUP READY PLUS herbicide treatments may be applied in soybean varieties that are designated ROUNDUP READY soybean cultivars. When Roundup Turbo is applied as a pre-plant treatment or Lasso MT is applied as a pre-emergent application, follow the recommendations on the manufacturer's label.

Maize

The above recommended ROUNDUP READY PLUS herbicide treatments may be applied in maize hybrids that are designated ROUNDUP READY maize hybrids. When Roundup Turbo is applied as a pre-plant treatment or Guardian S or Lasso MT or Bullet are applied as pre-emergent applications or Harness Xtra or 2,4-D amine or MCPA are applied as a post-emergent applications, follow the recommendations on the manufacturer's label.

2. Tank mixes with *ROUNDUP READY PLUS* herbicide in ROUNDUP READY Maize

ROUNDUP READY PLUS herbicide may be tank mixed with Guardian S or Lasso MT for pre-emergent applications, and with Harness Xtra EC or Lasso MT or 2,4-D amine or MCPA for post-emergent broadcast (before V8 stage) and post directed (after V8 stage) applications. Follow the manufacturers recommendations on the label. ROUNDUP READY PLUS herbicide should not be tank mixed with Atrazine.



Control of volunteer Roundup Ready® crops

RR Soyas in RR maize:

- 2,4 D (>45cm, directed) ; MCPA + Roundup Ready Plus.

RR maize in RR soyas:

- Post-emergence grass herbicides e.g. Focus Ultra + Roundup Ready Plus.

RR maize in RR maize:

- Post-emergence grass herbicides (e.g. 1 lt Agil®) in tank mix with Roundup® Turbo as pre-plant application & other practical considerations.
- Segregation occurs, not all plants contain RR-gene.
- Plant hybrids with good standability.
- Future YG/RR hybrids.
- Livestock factor.



Roundup® Ready Plus Application: Summary

- Use clean water.
- Use 100-125 lt water/ha.
- Adjust pH.
- Treat hard water with addition of AMS.
- Use correct dose, only Roundup® Ready Plus.
- Spray in the correct conditions.
- Avoid spray mixtures with foliar feeds.
- Spray at the correct weed growth stage (refer to label).
- Volunteer RR-maize can be successfully controlled with 1lt Agil (refer to label).
- Avoid aerial applications.
- Avoid contact with silk and pollen.

