



Pacific Pests, Pathogens & Weeds - Fact Sheets

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Tomato - residual herbicide (379)



Photo 1. Stunted tomato plant grown in land previously treated with glyphosate, Mount Hagen, Papua New Guinea.



Photo 2. Stunted, twisted plant with cup-shaped leaves, Port Vila, Vanuatu.



Photo 3. Plant showing twisted terminal growth and small, bunched leaves, Port Vila, Vanuatu.

Common Name

Tomato - residual herbicide effects.

Distribution

Papua New Guinea highlands, Fiji (possibly), and Vanuatu.

Hosts

Tomato

Impact

The impact of residual glyphosate on tomatoes is likely to vary a great deal. First, the type of soil, with sandy soils being the most likely to be associated with glyphosate damage. Secondly, the amount of glyphosate applied to the soil: it depends on the type of weeds. For hard-to-kill perennial grasses (e.g., Guinea grass, *Megathyrsus maximus* var. *maximus*; Johnson grass, *Sorghum halapense*; kangaroo grass, *Themeda australis*; and kikuya grass, *Pennisetum clandestinum*) glyphosate is recommended between 5-9 L/ha (depending on the species), whereas for thistles, wild oats, wild turnip, chickweeds, and other easier-to-kill annual weeds, the rate is 1.5-2.5

L/ha. Thirdly, the frequency of application. Fourthly, whether the glyphosate contains other herbicides to increase its residual activity.

All these factors combine to determine the effect of the residual glyphosate and the impact on plant growth and fruit yield.

Detection & inspection

Look for stunted plants with twisted, cupped, elongated leaves. Look to see if the youngest leaves are lighter green than normal, small and bunched. Note there is often variation between plants in a field, some with symptoms others healthy, which may indicate differences in concentrations of glyphosate in the soil or in uptake by the plants.

Management

CHOICE OF SITE

- Avoid growing tomatoes where glyphosate has been applied frequently at high rates against perennial plants. If this is not possible, leave at least 40 days between the last application and transplanting tomato seedlings,
- Avoid growing tomatoes on land that has a history of regular glyphosate treatment and where residues may have accumulated in the soil.
- Ensure what you are buying; for instance make sure that glyphosate does not contain any chemical that increases the products residual presence in the soil.
- Read the label carefully.
- Alternatively, carry out a bioassay as outlined below.

BIOASSAY

If tomatoes are to be grown in a field where glyphosate soil residues are a possibility, transplant test seedlings across the area prior to planting the entire crop. If toxicity is likely, symptoms should appear on the plants within 7 days.

Symptoms

Circumstantial evidence exists that tomato plants can be damaged by some herbicides remaining in the soil from previous treatment. Plants are yellowish, stunted, twisted and shoots are bunched (Photos 1-3).

Herbicides are often used on e.g., grasses to assist cultivation of land before planting tomatoes. Some of the herbicide will, inevitably, end up in the soil. Usually, this residue breaks down very quickly, in days or weeks. In fact, there are regulations ensuring that herbicides do so.

However, there are situations where the breakdown is slow, and problems may occur. For instance, many products that contain glyphosate have a warning on the label to tell tomato growers of potential problems:

"[Product name] may be used for weed control in agricultural land prior to sowing any edible crop or non-edible crop, *but not prior to transplanting tomato seedlings*".

Problems may occur in sandy soils, low in organic matter, that cannot hold onto glyphosate and where there is lower microbial activity; this means it is available in the soil and may be taken up by plant roots. Adding phosphorous fertilizer to these soils can make the situation worse as phosphorous tends to release glyphosate from clay particles making it available again. The reason for this is that glyphosate contains phosphonic acid and this competes with phosphorus from binding sites on soil particles.

Because tomatoes are very susceptible to glyphosate, and glyphosate can remain in some soils, product labels have the warning given above. In some cases, the label will state that there should be a 3-day waiting period between the application of glyphosate and transplanting tomato seedlings. But is this long enough?

In 1990, it was reported in Australia that glyphosate (active ingredient 360 g/L, 4 L/ha) caused growth defects in tomatoes even when the interval between soil treatment and transplanting was 9 days, and possibly as many as 30.

A more recent study by NSW DPI also suggests that glyphosate, and its breakdown product AMPA, maybe longer-lasting in certain soils than previously thought, especially those planted to sensitive crops. After 40 days, half the amount of glyphosate applied was still present in the soil.

However, the significance of this result in terms of damage to tomato is still to be tested. Just because glyphosate can be identified in soil does not mean that it is available, it may be bound to soil particles.

Furthermore, some brands of glyphosate add other herbicides to make the residual effect longer. For instance, there are glyphosate products with added imazapic.

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Information from How much glyphosate? (2016) *The Land* (<https://www.theland.com.au/story/3792459/residual-roundup-not-what-you-think/>); and Cornish PS (1992) Glyphosate residues in a sandy soil affect tomato transplants. *Australian Journal of Experimental Agriculture* 32: 395-9. (<http://www.publish.csiro.au/ezproxy.library.uq.edu.au/EA9920395>); and from Herbicide residues in soils - are they an issue? Northern. GRDC. Grains Research Development Corporation, Australian Government. (<https://grdc.com.au/resources-and-publications/grdc-update-papers/tab-content/grdc-update-papers/2016/02/herbicide-residues-in-soils-are-they-an-issue-northern>).

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