

Glyphosate Facts

A look into pre-harvest
Glyphosate usage in
Australia.

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The team here at [Ask An Aussie Farmer](#) has had a few questions come up on our wall regarding 'toxic wheat' and 'glyphosate applications at harvest'. Whilst the [article in question](#) is based in the United States of America, it does raise some interesting statements that could potentially be misleading. Interestingly, there also seems to be a lot of bloggers from the United States who have also discussed the issues with this article as well, including Facebook's [Petersen Brothers](#), and other blogs including [Nurse Loves Farmer](#) and the [Prairie Californian](#).

The main issue with the article in question is the fact that it implies that this is a regular practice of all farmers. The issue being this sort of logic, is the fact that there are many differences between wheat farming operations, including varieties grown, soil

types, production aims, climatic differences and also operational differences. Further to this, it has been estimated from United States EPA data that only 5% of US farmers follow this practice.

In Australia, pre-harvest applications of glyphosate on wheat are a very, very rare practice. Actually, it is practically unheard of in many farming operations within the Western Australian & South Australian grain growing regions. The aim of this document is to discuss the issues & errors within the American article, and discuss its relevance to Australian Agriculture.



So why do farmers use Glyphosate pre-harvest?

According to Sarah from *The Healthy Home Economist*,

“Glyphosate application on wheat allows for an earlier, easier & bigger harvest. Common wheat harvest protocol in the United States is to drench the wheat fields with Roundup several days before the combine harvesters work through the fields as the practice allows for an earlier, easier and bigger harvest”.

The issue with this statement is that it **generally is false**, in both America and Australia. In Australia in particular, there generally is no economic or production benefit in applying Glyphosate just days before harvest, and here we will explain why.

So why don't we need pre-harvest sprays?

1. Australia's dry climatic conditions are beneficial in the grain ripening stages, with heat, lower levels of soil moisture & wind being beneficial in the desiccation (drying-out) of crops. Significant weed germination levels are low around harvest time, and hence chemical control is very rarely used in cereal cropping.
2. Wheat is a determinate plant, which means that it ripens at the same time on each plant (whereas some Tomato varieties ripen & produce fruit at different times on the same plant). There is no need to apply a desiccant (a drying out chemical such as glyphosate) in wheat, as it flowers and ripens within the same growth stage, and relatively at the same time.





3. Farmers look at the ‘whole picture’ and take part in Integrated Pest Management ([IPM](#)) schemes. This means that they look at alternative control methods and the issues as a whole, rather than using chemicals. This could include swathing crops, rather than using desiccants.
4. Chemical applications can be expensive, and are legally subjected to application only under certain climatic & regulatory conditions. This means that growers can only apply in certain circumstances, according to the label only.
5. Wheat Varieties or [Cultivars](#) grown within Australia have been selected for local Australian conditions, including soil types, climate, [photoperiodism](#), [thermal time](#), [day length & vernalization](#). It is for this reason, that wheat varieties & cultivars in Australia can be different from the rest of the world in genetic structure or have different production requirements.

When would Australian farmers look at using glyphosate pre-harvest?

In Australia, the [Australian Pesticides and Veterinarian Medicines Authority \(APVMA\)](#) are the controller and regulator of agricultural & veterinarian products. The APVMA ultimately controls the potential applications & situations where chemicals can be used.

When farmers purchase chemicals from suppliers, they are legally obliged to follow the directions of the label contained on the drum or tank. This means that it is illegal to use the chemical in a way that is hasn’t been listed, with fines of up to [\\$250,000](#).

A particular chemical brand can offer many variants in concentrations with their active ingredients, and each concentration requires an individual registration with the APVMA. Roundup is one of the most common brand names for Glyphosate, and its active ingredient concentration varies from 360g/L in Roundup up to 570g/L in Roundup™ Ultra® MAX formulation. Different concentrations or active ingredient types can ultimately determine how and when a chemical product can be used.

Currently (and this is subject to change with the APVMA), [Roundup™ Ultra® MAX](#) is registered for use in Wheat crops pre-harvest as a “*harvest aid and weed control*”, subject to plant growth stage and withholding periods, so farmers can legally use this product for the above reasons. As previously mentioned, many of the farming practices employed by Australian farmers generally do not require a glyphosate application pre-harvest for weed control.

Are there any yield benefits in applying glyphosate pre-harvest? And when is yield determined?

A quick literature search on [Google Scholar](#) yields very few research papers that discuss any yield benefits in applying glyphosate pre-harvest, especially since the early 2000's.

One research paper by [Derwent et al.](#) found that yields increased slightly in America where crops were desiccated by glyphosate compared to windrowed treatments, but this was dependent upon growth stages, moisture and weather conditions. It was also noted that the differences in yield could also be attributed to differences in mechanical losses and the relative rates of arrest in plant growth and development.

Wheat yield is determined by many different components, and is the ultimate outcome of genetic, environmental & crop management factors. According to [The Wheat Book](#), the main genetic yield components of wheat crops are:

- The number of ears per square metre (E);
- The number of spikelets per ear (Sp);
- The number of grains per spikelet (Gr); and
- The individual weights of each grain (Wg) in grams.

These genetic factors are visually represented within figure 1. Environmentally speaking, yield is determined by climatic factors such as temperature, photoperiod, vernalisation and basic vegetative period, whilst management factors such as plant nutrition, weed management and disease management can help increase final yields. All of these factors combined, determine the final yield potential for the wheat crop itself, rather than a pre-harvest application of glyphosate.

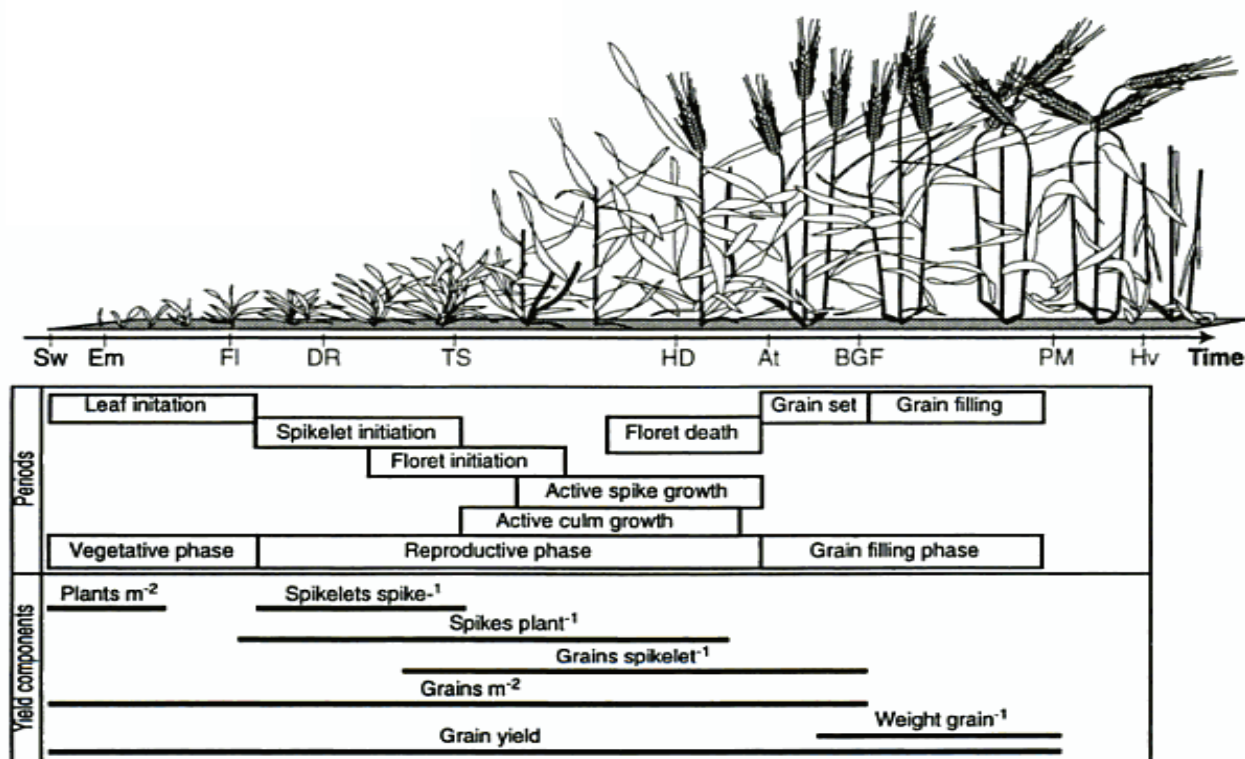


Figure 1: A complete schematic approach in determining final yield potential in Wheat, as appeared in [“Increasing Yield Potential in Wheat: Breaking The Barriers \(1996\)”](#)

Safe use of glyphosate & chemical products

What are Chemical “Modes of Action”, and how does Glyphosate work?

A ‘Mode of Action’ is the terminology that scientists use to describe how a pesticide effectively interacts with the plant. It is based on an alphabetical system for herbicides, with each letter being dedicated to a particular plant health pathway. Different chemicals have different Modes of Action, and this is important in resistance management and/or the ability to spray out particular weeds over others.

According to Monsanto, Glyphosate is a complex molecule comprised of nitrogen, phosphorous, oxygen, carbon and hydrogen atoms and belongs to chemical group M mode of action. This simply means, that this product inhibits an essential enzyme known as EPSPS (5-enolpyruvyl – shikimate – 3 – phosphate synthase), which is required for protein synthesis.

The chemical is applied by spray equipment, and the chemical enters through plant foliage. Once the chemical is within the plant, it is transported with the sugars to growing points. This process generally covers the whole plant in approximately in 4 hours, and completely stops all transport after approximately 48 hours. Water & nutrient stress, dust and extreme weather can all affect the overall uptake of Glyphosate in the plant.

So what happens if glyphosate is applied to wheat days before harvest?

If glyphosate is applied pre-harvest, there is a minimum withholding period of 7 days before that crop can be harvested. This is to ensure that residue levels are minimal within the grain. Maximum residue limits (MRL’s) for glyphosate in wheat crops is 5mg/kg, and this value is based on extensive testing of the products chemistry, metabolism and residue trial data. The final MRL value has a safety guard built in, to ensure that slight increase in residue levels is unlikely to pose a health risk. Scientific literature has also shown that as moisture levels decrease within the plant, so does the ability for the chemical to translocate to the seed. This has also been confirmed with mature plants, where the residues only occur on the seed surface from application. When grain is delivered to a receival point (such as CBH, Graincorp or Viterra/Glencore), growers can be subjected to residue testing, with significant fines and penalties applied if they are found to be in breach of withholding periods and maximum residue levels.

Correlations

The article in question makes some pretty concerning statements in regards to correlation values between glyphosate usage and an increase in health issues throughout westernised regions. Further research into the matter, it was determined that the information that the blogger used originated from a 48 page [scientific report](#) which could be highly questioned by any scientist. In fact, a quick Google of the [authors name](#) yields some interesting commentary about the scientists' background, the report in question and potentially their motives.

As a scientist, alarm bells ring when you see commentary from the authors coming out of the paper such as *"It is reasonable to suspect that glyphosate's impact on gut bacteria may be contributing to these diseases and conditions"*. The research paper in concern doesn't publicise results from their own scientific data, but appears to make generalisations and assumptions that many of the health issues are related to glyphosate usage. This point is further proven by a statement quoted within the paper as *"A review of the literature on glyphosate has confirmed our suspicions that glyphosate might play a role, and, further, have led us to believe that glyphosate may be the most significant environmental toxin contributing to autism."*

Good science is based upon evidence, and not assumptions. The issues with using assumptions and basic statistical analyses such as correlations, is that you are linking two different data sets together, to see if there is a mathematical relationship. Sometimes there are, sometimes there are not. But these mathematical relationships sometimes need to be taken as a grain of salt. It is important to remember that correlation does not equate to causation, and increased glyphosate usage does not necessarily mean that there will be higher levels of autism, with [spurious correlations](#) existing in today's society. Just think about the almost perfect (0.9999) correlation between Italians that died last year and those who ate tomatoes.

Summary

- Final yield is determined throughout the plant-growing season, and not due to pre-harvest glyphosate applications.
- Pre-harvest applications of glyphosate across Australia is a rare exercise, and is looked upon as the last option for weed management.
- Maximum residue levels include a safety guard to ensure that residue levels will not impact human health
- Withholdings periods of 7 days currently exist to ensure that residue levels are low in grain.
- Concentrations of glyphosate are low within the grain itself.



Useful Websites

- [APVMA](#)
- [APVMA Label Search](#)
- [Ask An Aussie Farmer](#)
- [GRDC Pre-Harvest Glyphosate Fact Sheet](#)
- [Maximum Residue Limits](#)



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