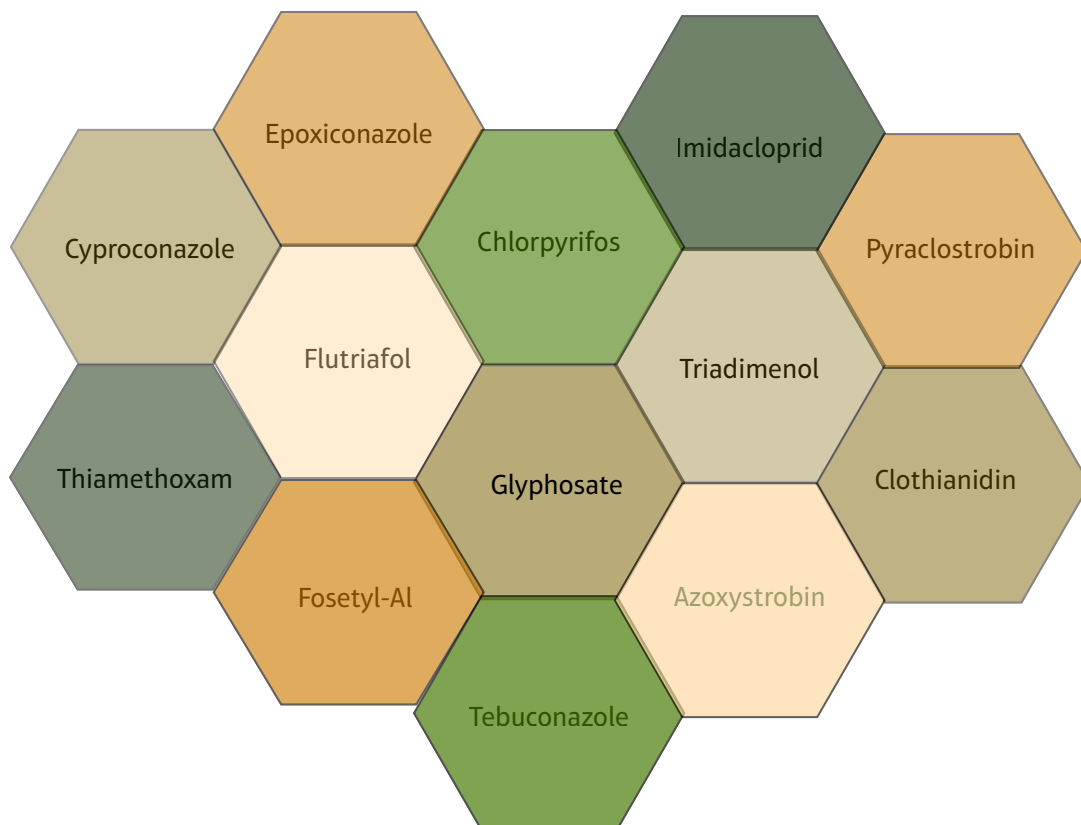




NKG Pesticide Fact Sheets

What can you expect?

Key Information about important pesticides in coffee farming.



Why do we share these Factsheets?

As a global coffee company active along the entire value chain we see it as our responsibility to raise awareness around the use of pesticides in coffee production.

These Factsheets provide clear, concise information on selected pesticide active substances relevant to coffee — including their use, regulatory status, residue limits, and potential risks to human and environmental health.

Are these Factsheets for you ?

By making this resource accessible across our subsidiaries and supply chain partners, we aim to support informed decision-making and promote transparency and product safety throughout our operations

Further questions?

Please contact us !



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Imidacloprid

What is Imidacloprid?

Imidacloprid is an insecticide from the neonicotinoid group. It is a systemic insecticide, which means that plants take it up from the soil or through the leaves and it spreads throughout the plant's stems, leaves, fruit, and flowers. Insects that chew or suck on the treated plants end up eating the imidacloprid as well. Once the insects eat the imidacloprid, it damages their nervous system, and they eventually die.

What is Imidacloprid used for?

Imidacloprid is primarily used as a pesticide in agriculture to control sucking insects, termites, some soil insects, and fleas on pets.



MRL EU: 1 mg/kg US: 0.8 mg/kg

Regulatory Status

- It may not be used in open fields (outdoors).
- It is no longer approved as a plant protection product (pesticide).
- It may only be used in certain biocidal applications (e.g. insecticide products) — and only under specific conditions, and possibly only until the end of 2025 (depending on biocidal regulations).
- Outside of the EU: many coffee-producing countries (e.g. Brazil, Vietnam) still allow its use.
- In a 2019 EFSA assessment, available data on imidacloprid residues in coffee beans were insufficient for a full risk evaluation.



Integrated Weed Management Recommendations

- Encourage beneficial insects and pollinators by maintaining flowering plants and diverse shade systems.
- Monitor pest levels carefully and avoid prophylactic insecticide use, especially during flowering periods.
- Prefer biological control agents or targeted pest management practices before applying systemic insecticides like Imidacloprid.



Risks related to human Health

- Imidacloprid is significantly less toxic to mammals and birds than to insects.
- Consumer risk is considered acceptable if residue levels remain below the MRL.



Risks related to the environment

- Poses a serious threat to pollinators, especially bees.
- Long-term exposure can harm non-target insects.
- These concerns contributed to the non-renewal of EU approval.





Thiamethoxam

What is Thiamethoxam?

Thiamethoxam is a systemic insecticide from the neonicotinoid group. It is absorbed by plants through roots or leaves and distributed throughout all plant tissues. Insects that feed or suck on treated plants ingest thiamethoxam, which affects their nervous system and ultimately kills them.

What is Thiamethoxam used for?

Thiamethoxam is used in agriculture to control sucking and chewing insects such as aphids, whiteflies, thrips, and certain beetles. It is also commonly used as a seed treatment, especially in crops like maize, oilseed rape, and sugar beet.



MRL EU: 0.05 mg/kg US: 0.2 mg/kg

Regulatory Status

- Approval as a plant protection active substance expired on 30 April 2019.
- Regulation (EU) 2023/334 lowers MRLs for thiamethoxam to the limit of quantification (LOQ), typically 0.01 mg/kg, effective from 7 March 2026. While the LOQ for many commodities is 0.01 mg/kg, for coffee the specific new MRL will be 0.05 mg/kg.
- Outside of the EU: many coffee-producing countries (e.g., Brazil, Vietnam) still allow the use of thiamethoxam. Validated analytical methods for thiamethoxam are sensitive, with detection limits around 0.01 mg/kg or lower.
- Data on residue levels in coffee are limited, but where available, they usually show low residues when the substance is used according to regulations.



Integrated Weed Management Recommendations

- Implement regular pest scouting and threshold-based interventions to ensure insecticides are only applied when necessary.
- Support biodiversity and natural enemies through diversified shade and habitat structures.
- Avoid use during flowering or periods of high pollinator activity.



Risks related to human Health

- Thiamethoxam shows relatively low toxicity to mammals and birds.
- Consumer exposure is considered acceptable as long as residue levels remain below established maximum residue limits.



Risks related to the environment

- Highly toxic to pollinators, particularly bees.
- Long-term exposure poses significant risks to bee health and other non-target insects.
- The Commission therefore restricted its use to greenhouses.





Clothianidin

What is Clothianidin?

Clothianidin is a systemic insecticide belonging to the neonicotinoid class. It is absorbed by plants and distributed throughout their tissues. Insects feeding on treated plants ingest clothianidin, which targets their nervous system and leads to paralysis and death.

What is Clothianidin used for?

Clothianidin is used in agriculture to control sucking and chewing pests, particularly in crops like maize, oilseed rape, sugar beet, and rice. It is commonly applied as a seed treatment, foliar spray, or soil application.



MRL EU: 0.05 mg/kg US: < 0.01 mg/kg*

*no established tolerance for coffee; zero tolerance applies

Regulatory Status

- Fully banned on outdoor use adopted by the European Commission, based on EFSA's risk assessment concerning pollinator health since 2018.
- Approval as a plant protection substance expired on 31 January 2019; grace period ended 3 August 2019.
- Currently clothianidin is no longer approved for use in the EU.

Integrated Weed Management Recommendations

- Strengthen ecosystem-based pest control through shade tree diversity and habitat for beneficial insects.
- Use monitoring tools and pest thresholds to guide intervention decisions.
- Prioritize non-chemical or biological pest control methods whenever feasible.

Risks related to human Health

- Consumer exposure appears acceptable when residue levels stay below existing MRLs, though their assessment remains indicative only due to missing data.
- EU regulations have significantly lowered MRLs for clothianidin, ranging from 0.01 to 0.05 mg/kg, with full application from March 2026, aiming to safeguard consumer health and pollinators alike.

Risks related to the environment

- Clothianidin poses high toxicity to bees and other pollinators.
- EFSA also pointed to concerns about long-term environmental exposure, persistence in soil and water, and potential impacts on non-target organisms.



Cyproconazole

What is Cyproconazole?

Cyproconazole is a systemic triazole fungicide used to control fungal diseases in various crops. It works by inhibiting the biosynthesis of ergosterol, an essential component of fungal cell membranes, leading to the death of the fungi.

What is Cyproconazole used for?

Cyproconazole is mainly used in agriculture to protect cereals, fruits, and vegetables from diseases such as rusts, leaf spots, and powdery mildew. It is applied as a foliar spray and sometimes as a seed treatment.



MRL EU: 0.1 mg/kg* US: 0.1 mg/kg

*Cyproconazole (F) will be superseded by Cyproconazole (sum of isomers) (F) on a date yet to be specified. Consequently, the MRL is expected to be changed to 0.07 mg/kg; however, this is still pending as the corresponding regulation has not yet been published.

Regulatory Status

- Approval status: Cyproconazole is no longer approved for use in the EU. Its approval expired and was not renewed after the last renewal period ended.
- Import tolerances: The EU Parliament has called for all import tolerances to be removed, so that the default MRL applies to all imported foods as well.
- Cyproconazole is permitted in many coffee-producing countries, but national regulations may vary.
- Validated analytical methods exist, with detection limits generally below 0.01 mg/kg.
- Residue monitoring data in coffee beans are limited but generally show low levels when used according to good agricultural practices.

Integrated Weed Management Recommendations

- Improve air circulation in coffee plots through appropriate pruning and shade management to reduce fungal disease pressure.
- Use disease monitoring and forecasting to apply fungicide treatments only when infection risk is high.
- Favor resistant coffee varieties and balanced soil nutrition to strengthen plant resilience.

Risks related to human Health

- May pose health risks if misused, including potential effects on the liver and reproductive organs, as seen in animal studies.
- Consumer exposure through food is considered acceptable when residues remain below the established maximum residue levels.
- Chronic and acute exposure estimates are well below toxicological thresholds.

Risks related to the environment

- Classified as toxic to reproduction and very toxic to aquatic organisms, both short- and long-term.
- EFSA and the EU Commission have raised concerns about its impact on non-target species and the possible promotion of azole-resistant fungi.
- No longer approved in the EU, and the default MRL of 0.01 mg/kg is recommended as a precaution.



Epoxiconazole

What is Epoxiconazole ?

Epoxiconazole is a systemic fungicide belonging to the triazole class of chemicals. It works by inhibiting the biosynthesis of ergosterol, a key component of fungal cell membranes, thereby stopping fungal growth.

What is Epoxiconazole used for?

Epoxiconazole is a systemic fungicide used mainly in agriculture to protect crops like wheat, barley, and soybeans from fungal diseases. It is primarily applied to cereal crops such as wheat, barley, and rye. The supported uses include treatment against diseases like: Septoria leaf blotch, rusts and Fusarium head blight



MRL EU: 0.05 mg/kg US: 0.05 mg/kg

Regulatory Status

- Approval of epoxiconazole expired on 30th April 2020
- Epoxiconazole is permitted in many coffee-producing countries, but national regulations may vary (Brazil, Mexico, Vietnam).
- Adequate analytical methods for enforcement are available to control the residues of epoxiconazole in the commodities under evaluation at the validated limit of quantification (LOQ) of 0.01 mg/kg.
- No epoxiconazole residues in coffee beans are reported in the official EFSA annual reports.



Integrated Weed Management Recommendations

- Maintain well-managed shade and pruning regimes to reduce humidity and fungal development.
- Monitor disease levels and apply treatments only when threshold levels are exceeded.
- Rotate disease management strategies to avoid reliance on single fungicide groups.

Risks related to human Health

- Epoxiconazole is classified as a reproductive toxicant due to observed developmental effects in animal studies, including cleft palate and embryo/fetal toxicity.
- Causes liver toxicity and other systemic effects.
- Additional concerns have been raised over its triazole derivative metabolites (TDMs), whose toxicological profiles are not yet fully understood, leading to ongoing uncertainty regarding their health impact.



Risks related to the environment

- Epoxiconazole is moderately persistent in soil and may have potential for bioaccumulation, although long-term risks to soil organisms were not identified.
- Risks to aquatic organisms, including fish and aquatic plants, cannot be excluded under certain conditions.
- No acute risks to bees or non-target arthropods were observed with proper use.



Flutriafol

What is Flutriafol?

Flutriafol is a systemic fungicide from the triazole class. It inhibits fungal sterol biosynthesis, disrupting cell membrane formation in fungi.

What is Flutriafol used for?

Used mainly to control fungal diseases like powdery mildew, rust, and leaf spots in cereals, fruits, vegetables, and sugar beet, applied as foliar spray or seed treatment.



MRL EU: 0.15 mg/kg US: 0.15 mg/kg

Regulatory Status

- Approved in the EU with risk mitigation measures to reduce environmental risks.
- Flutriafol is authorized in many countries including Brazil, USA, and China, under their national regulations.
- Residues in green coffee beans are generally low, rarely exceeding MRLs when used properly.
- Analytical methods have detection limits below 0.01 mg/kg.

Integrated Weed Management Recommendations

- Promote good canopy management and adequate plant spacing to improve airflow and reduce fungal outbreaks.
- Conduct regular field scouting for early disease detection before considering chemical treatments.
- Combine resistant varieties and soil health management to reduce disease susceptibility.

Risks related to human Health

- Flutriafol may cause liver and developmental toxicity based on animal studies.
- EFSA identified data gaps regarding plant metabolites and residue definitions, especially for triazole derivatives.
- Due to missing data on residues in animal products, a complete consumer risk assessment is not possible.

Risks related to the environment

- Flutriafol is very stable in soil and aquatic environments and shows medium to high mobility in soil, raising concerns about groundwater contamination.
- A critical area of concern was identified for its potential to leach into groundwater.
- A high long-term risk to insectivorous birds was noted
- Unresolved issues: The ecotoxicological relevance of impurities remains unclear.



Triadimenol

What is Triadimenol?

Triadimenol is a systemic fungicide used in agriculture to protect crops from fungal diseases. It belongs to the triazole chemical group and works by inhibiting the synthesis of ergosterol, a key component of fungal cell membranes.

What is Triadimenol used for?

It was mainly used on cereals like wheat and barley, and also for seed treatment.



MRL EU: 0.05 mg/kg US: < 0.01 mg/kg*

*no established tolerance for coffee; zero tolerance applies

	Regulatory Status • The approval of triadimenol expired on 31 August 2019. • In coffee-producing countries like Brazil, Vietnam, Mexico, and Nicaragua, triadimenol is still commonly used, especially to combat coffee leaf rust. In conventional farming, it remains part of the standard fungicide toolkit. • In the United States, triadimenol is approved by the EPA for certain crops, but not specifically for coffee, as coffee farming is limited (mainly in Hawaii) and often organic. Its use on coffee is therefore rare.		Integrated Weed Management Recommendations • Maintain balanced plant nutrition and soil health to enhance natural disease resistance. • Reduce disease pressure through shade management and removal of infected plant material. • Apply fungicides only when monitoring indicates significant disease risk.
	Risks related to human Health • Triadimenol is classified as a reproductive toxicant and is possibly carcinogenic. • Toxicity observed in animal studies primarily affects the liver, kidneys, and reproductive system. • Consumer risk is considered acceptable as long as residue levels remain below established MRLs.		Risks related to the environment • Triadimenol is moderately toxic to aquatic organisms, posing potential risks to aquatic environments. • Appropriate risk mitigation measures are necessary to minimize environmental impact.



Pyraclostrobin

What is Pyraclostrobin?

Pyraclostrobin is a broad-spectrum fungicide used in agriculture to protect crops from fungal diseases. It belongs to the strobilurin chemical group (QoI fungicides) and works by inhibiting mitochondrial respiration in fungal cells, effectively blocking energy production and stopping fungal growth.

What is Pyraclostrobin used for?

Pyraclostrobin is used as an active substance in plant protection products to control pests and diseases, particularly foliar fungi.



MRL EU: 0.3 mg/kg US: 0.3 mg/kg

Regulatory Status

- Currently approved for use within the EU.
- Approval has been extended until 15 September 2026.
- Pyraclostrobin is allowed and used in several coffee-producing countries—both for domestic disease management (e.g., Kenya) and for export purposes (e.g., Brazil exporting to EU markets).
- Pyraclostrobin residues were assessed by EFSA in various crops, but coffee was not included in the representative uses.

Integrated Weed Management Recommendations

- Strengthen plant resilience through improved soil fertility and balanced nutrient management.
- Use disease monitoring and weather-based risk assessments before intervention.
- Integrate cultural practices such as pruning and sanitation to reduce fungal spread.

Risks related to human Health

- No critical concerns were identified regarding human exposure.
- According to EFSA's conclusions, pyraclostrobin does not meet the criteria for endocrine disruption* for either humans or wildlife.
- Consumer exposure through diet remains well below toxicological reference values, and no unacceptable operator, worker, or bystander risk was found.

Risks related to the environment

- Pyraclostrobin presents a high risk to aquatic invertebrates for most intended uses, even when standard risk mitigation measures (e.g. buffer zones) are applied—except for potatoes, where the risk is considered acceptable.
- For birds, mammals, and soil organisms, the environmental risk is generally assessed as low, provided use conditions are followed.

*ED criteria refers to Endocrine Disruptor criteria — a set of scientific standards used in the EU to determine whether a substance can interfere with the hormonal (endocrine) system of humans or wildlife.

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Azoxystrobin

What is Azoxystrobin?

Azoxystrobin is a broad-spectrum fungicide with preventative, systemic, and curative properties, widely used in agriculture and horticulture.

What is Azoxystrobin used for?

It is used to protect crops such as cereals, fruits, vegetables, turf, and ornamentals from fungal diseases like powdery mildew, rusts, leaf spots, blights, anthracnose, and downy mildew. It is typically applied as a foliar spray, in tank mixes, or in alternating spray programs to ensure effective disease control and resistance management.



MRL EU: 0.03 mg/kg US: 0.03 mg/kg



Regulatory Status

- Currently approved under EU Regulation (EC) No. 1107/2009, with latest peer-reviewed assessments confirming its regulatory renewal through 31 May 2027.
- Allowed and widely used in several coffee-producing countries, including Vietnam, Brazil, Colombia, and Ethiopia.



Integrated Weed Management Recommendations

- Maintain adequate spacing and canopy management to reduce humidity in coffee plots.
- Monitor fields for early signs of fungal disease and intervene only when necessary.
- Use crop diversification and resistant varieties where possible to reduce disease pressure.



Risks related to human Health

- Based on the available residue trials and toxicological reference values, EFSA concludes that the presence of azoxystrobin residues in coffee beans at the reported levels is not expected to lead to a consumer exposure exceeding the acceptable daily intake (ADI), and therefore is unlikely to pose a risk to consumer health.



Risks related to the environment

- Azoxystrobin poses moderate to high risks to non-target aquatic organisms, especially invertebrates like zooplankton and sediment-dwelling species, even at low concentrations (~0.01 mg/l).
- Potential toxicity to soil organisms such as earthworms has also been observed. Risk mitigation measures are recommended to limit environmental exposure.



Tebuconazole

What is Tebuconazole?

Tebuconazole is a systemic fungicide belonging to the triazole chemical group. It inhibits ergosterol biosynthesis in fungi, disrupting their cell membrane formation and thereby controlling fungal diseases.

What is Tebuconazole used for?

Tebuconazole is widely used in agriculture to protect a variety of crops including cereals, fruits, vegetables, and coffee against fungal diseases such as rusts, powdery mildew, and leaf spots. It is often part of fungicide programs in coffee-growing countries to combat leaf rust and other diseases.



MRL EU: 0.1 mg/kg US: 0.15 mg/kg*

*US: Green beans: 0.15 mg/kg and roasted beans: 0.3 mg/kg

Regulatory Status

- Approval has been renewed, with the latest peer review confirming safety for continued use until 15/08/2026.
- Tebuconazole is allowed and commonly used in major coffee-producing countries such as Brazil, Colombia, Vietnam, and Ethiopia.
- It is an important fungicide for controlling coffee leaf rust and other fungal diseases in conventional farming systems.
- Use regulations and application rates vary by country.

Integrated Weed Management Recommendations

- Apply preventive cultural practices such as pruning, shade regulation, and removal of diseased plant material.
- Conduct regular disease scouting to guide targeted interventions rather than routine spraying.
- Integrate soil health and balanced fertilization to strengthen plant defense mechanisms.

Risks related to human Health

- Tebuconazole is classified as toxic to reproduction (Category 2) and has shown developmental effects in animal studies.
- Not considered an endocrine disruptor** under EU criteria.

Risks related to the environment

- Tebuconazole poses a high risk to aquatic organisms, particularly algae, fish, and aquatic invertebrates, even at low concentrations.
- It is persistent in soil and can leach into water bodies, especially on light soils.
- Risks to bees and soil organisms are considered low to moderate, but risk mitigation measures (e.g. buffer zones) are required to protect aquatic environments.

**ED criteria refers to Endocrine Disruptor criteria — a set of scientific standards used in the EU to determine whether a substance can interfere with the hormonal (endocrine) system of humans or wildlife.

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Fosetyl-Al

What is Fosetyl-Al?

Fosetyl-Al (aluminium tris(ethyl phosphonate)) is a systemic fungicide of the phosphonate class. It is absorbed by plants and hydrolyzed to ethanol and phosphonic acid, the latter being its main active metabolite.

What is Fosetyl-Al used for?

It is approved for use as a fungicide and bactericide on permanent crops such as grapes (against downy mildew), citrus, and pome fruits. Representative formulations include WG (water-dispersible granules) and WP (wettable powder).

Fosetyl-Al is rapidly converted into phosphonic acid in plants. As a result, the applicable EU residue definition is now "phosphonic acid and its salts, expressed as phosphonic acid."



MRL EU: 20 mg/kg* US: < 0.01 mg/kg**

*EU: as phosphonic acid ** US: no established tolerance for coffee; zero tolerance applies

Regulatory Status

- Fosetyl-Al is not banned; it remains approved under EU Regulation (EC) No 1107/2009 until October 31st 2026.
- Fosetyl-Al is allowed in most major coffee-producing countries, including Brazil, Vietnam, Colombia, and Ethiopia. It is not banned in these countries and is commonly used as a fungicide in coffee and other crops.

Integrated Weed Management Recommendations

- Improve soil health and root vigor through organic matter restoration and balanced nutrition.
- Ensure proper drainage and water management to prevent root and soil-borne diseases.
- Use preventive monitoring and sanitation practices before considering fungicide application.

Risks related to human Health

- Fosetyl-Al has low acute toxicity and is not classified as carcinogenic, genotoxic, or teratogenic.
- It is rapidly metabolized in plants to phosphonic acid, which is considered the main residue of concern.
- Consumer exposure through food was assessed and found to be well below toxicological thresholds, indicating no health concerns when used according to good agricultural practices.

Risks related to the environment

- Environmental risks from fosetyl-Al are generally considered low, provided standard mitigation measures such as buffer zones are in place.
- EFSA identified minimal risk to aquatic and soil organisms, and groundwater contamination is unlikely, with residue levels expected to remain below the EU drinking water limit of 0.1 µg/L.
- However, some data gaps remain—particularly regarding endocrine-disrupting properties** and long-term effects on non-target plants.

**ED criteria refers to Endocrine Disruptor criteria — a set of scientific standards used in the EU to determine whether a substance can interfere with the hormonal (endocrine) system of humans or wildlife.

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Chlorpyrifos

What is Chlorpyrifos?

Chlorpyrifos and chlorpyrifos-methyl are insecticides used for pest control on a range of crops. They were developed by Dow Chemical in 1960s. Most common brand names are Dursban, Empire, Eradex, Lorsban, Pyrinex and Stipend.

What is Chlorpyrifos used for?

In coffee, it is mostly used in farming against coffee borers (broca) as last alternative inside of Pest Control and mostly used when the broca infestation is on higher.



MRL EU: 0.01 mg/kg US: < 0.01 mg/kg*

*no established tolerance for coffee; zero tolerance applies

Regulatory Status

- Chlorpyrifos is banned in the EU since January 2020.
- While chlorpyrifos is banned in the EU, USA, and over 40 other countries (including Vietnam and Thailand), it is still allowed (with restrictions or exemptions) in many coffee origin countries.
- From past analytical tests, from information provided by the European Coffee Federation (ECF) and from laboratories we work with in Germany, residue values of chlorpyrifos and chlorpyrifos-methyl are rarely found in green coffee and if found, the value is <0.05 mg/kg.

Integrated Weed Management Recommendations

- Monitor pest populations through regular scouting and economic thresholds to avoid preventive insecticide applications.
- Promote natural pest control by maintaining shade diversity and habitats for beneficial insects and predators.
- Prioritize biological controls or targeted traps before considering insecticide use.

Risks related to human Health

- Chlorpyrifos is a neurotoxic pesticide that disrupts the nervous system by inhibiting acetylcholinesterase.
- Even low-level exposure has been linked to developmental issues in children, including reduced IQ, behavioural disorders, and potential links to autism.
- It may also cause DNA damage, affect reproductive health, and trigger autoimmune responses.

Risks related to the environment

- Chlorpyrifos is highly toxic to aquatic life and can persist in soil and water, leading to long-term contamination.
- It bioaccumulates in ecosystems and has been found in food and drinking water.
- Its widespread use threatens biodiversity and disrupts ecological balance.



Glyphosate

What is Glyphosate?

Glyphosate is a broad-spectrum, non-selective herbicide widely used to control weeds and grasses. It works by inhibiting an enzyme called EPSP synthase, which plays a crucial role in the shikimic acid pathway—a biological process essential for plant growth. This pathway exists in plants and some microorganisms, but not in animals, which is why glyphosate selectively affects plant life.

What is Glyphosate used for?

Glyphosate is the active ingredient in many commercial weed-control products and is applied across various sectors, including agriculture, forestry, gardening, and industrial weed management. In agriculture, it is also sometimes used as a desiccant to dry crops before harvest.



MRL EU: 0.1 mg/kg*

US: 1 mg/kg

*The MRL is based on import tolerances since glyphosate is not used on coffee within the EU. There have been discussions about lowering this level to 0.05 mg/kg.

Regulatory Status

- Glyphosate is currently approved for use in the EU until 15 December 2023.
- In November 2023, the European Commission renewed its approval for 10 more years after EU member states failed to reach a qualified majority for or against the renewal.
- The renewal includes specific conditions and restrictions:
 - Pre-harvest use as a desiccant is banned.
 - Protective measures must be taken to safeguard non-target organisms such as pollinators and aquatic life.
 - Each EU country can still impose national bans based on its own risk assessments or biodiversity concerns.
 - Glyphosate residues in coffee available in the EU are generally very low and well controlled.
 - Glyphosate can be reliably detected in coffee beans down to about 0.01 mg/kg using validated LC-MS/MS methods.
 - Based on the available publications and testing statistics from the coffee industry, it has been confirmed that glyphosate is detectable in individual samples.



Integrated Weed Management Recommendations

- Maintain permanent ground cover (cover crops, mulching, shade leaf litter) to suppress weed emergence and reduce the need for chemical weed control.
- Apply mechanical or manual weed control (slashing, mowing, selective hand weeding) especially in young coffee plots and around tree bases.
- If use is unavoidable, apply spot treatments only on actively growing weeds, avoiding blanket spraying and preventing drift onto coffee plants or soil.



Risks related to human Health

- Glyphosate is considered “probably carcinogenic” by the IARC, but agencies like EFSA and EPA see little risk to humans when used properly.
- There are some studies suggesting possible effects on the liver, kidneys, and hormone system, but the evidence is debated.



Risks related to the environment

- Glyphosate can reduce plant diversity, harm soil organisms, and contaminate water, which may negatively impact biodiversity.
- Its environmental risks are widely discussed and remain controversial.

