Herbicides poisoning

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Philosophy of Use & History of Herbicides

- **Labor Cost Reduction:** Mechanized and chemical weed control significantly lowers labor expenses compared to manual weeding.
- **Yield Efficiency:** Prevents weed competition for water, nutrients, and sunlight, thereby maximizing crop and pasture productivity.

History

•**Pre-1940:** Limited use of inorganic chemicals (e.g., sulfuric acid, copper sulfate).

•**1940s (The Turning Point):** Introduction of **2,4-D** (the first selective synthetic herbicide), marking the modern era of chemical weed control.

•**1950s–1970s:** Development of highly potent contact and systemic herbicides (e.g., Paraquat and Glyphosate).

Concise Classification of Herbicides

•**Bipyridyls:**

Examples: Paraquat, Diquat.

Action: Highly toxic contact herbicides causing severe oxidative tissue damage.

•**Phenoxy Acids:**

Examples: 2,4-D, MCPA.

Action: Synthetic auxins disrupting plant growth; toxic to the nervous and muscular systems of mammals.

•**Glycine Derivatives (Organophosphorus Herbicides):**

Examples: Glyphosate (Roundup).

Action: Systemic non-selective herbicides (Aminoacids production inhibitor); toxicity in animals is primarily driven by accompanying surfactants (e.g., POEA).

•**Dinitrophenols:**

Examples: DNOC (Dinitro-ortho-cresol).

Action: Uncouplers of oxidative phosphorylation, causing severe hyperthermia. [mitochondrial dysfunction]

Common Herbicides Available in the Iranian Agricultural Market

•**Glyphosate (Glyphosate / Roundup):**

Status: The most widely used general systemic herbicide in Iranian orchards and farming fields.

•**2,4-D (2,4-D Amine / Ester):**

Status: Extremely common for weed control in cereal (wheat and barley) farms across Iran.

•**Paraquat (Gramoxone):**

•*Status:* Still utilized as a non-selective contact herbicide (though subject to stricter global and regional regulations, accidental livestock poisonings still occur).

•**Atrazine:**

•*Status:* Frequently used in corn and maize fields in various agricultural regions of Iran.

۲. جدول زمانی تقریبی برای محصولات اصلی ایران

فصل / ماه	محصول / هدف	علف‌کش رایج
بهمن – اسفند	آماده‌سازی زمین، مزارع پاییزه	پاراکوات، گلایفوسیت
فروردین – اردیبهشت	گندم، جو، ذرت (بعد از رویش)	2,4-D، تری‌بنورون
اردیبهشت – خرداد	باغات، مراتع، مزارع ذرت	گلایفوسیت، آترازین
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2, 4 D: پهن برگ کش هورمونی ... مزارع گندم و جو

رانداپ: همه چب کش عمقی

گِرماکسن (پاراکوآت): همه چی کش سطحی .... برای علف های چندساله خوب نیست

سوپرگالانت: تیزبرگ کش به جز پیاز .... مزارع پیاز

نیکوسولفورون (کروز): مزارع ذرت

تری بنورون: پهن برگ کش ... مزارع گندم

دسته پنجم: مهار کنندگان آنزیم های گیاهی







Pathogenesis

- **Bipyridyls (e.g., Paraquat):**

Mechanism: Generates massive **Reactive Oxygen Species (ROS)** → Lipid peroxidation.

Target: Selectively concentrates in the **lungs** (alveolar pneumocytes).

Result: Severe, irreversible **pulmonary fibrosis** and asphyxiation. (*Warning: Oxygen therapy is strictly contraindicated!*)

• **Phenoxy Acids (e.g., 2,4-D):**

Mechanism: Uncouples mitochondrial oxidative phosphorylation [Mitochondrial dysfunction].

Target: Skeletal muscles and CNS.

Result: Muscular **myotonia**, weakness, and ataxia. (*Indirect effect: increases palatability of toxic plants in pastures*.)

• **Glycine Derivatives (e.g., Glyphosate / Roundup):**

Mechanism: Glyphosate does **not** inhibit cholinesterase. Toxicity is driven by accompanying surfactants (like **POEA**).

Target: GI tract, cardiovascular system.

Result: Direct mucosal corrosion, hypotension, and risk of **aspiration pneumonia** from foaming.

- **Triazines (e.g., Atrazine):**

Mechanism: Acts as an **endocrine disruptor**.

Target: Hypothalamic-pituitary axis and liver (CYP450).

Result: Hormonal imbalance, reproductive/estrus disruption, and neuroendocrine toxicity.

- **Severe pulmonary involvement and progressive dyspnea → Paraquat**
- **Stiff gait, muscle rigidity (myotonia), and hindlimb weakness → 2,4-D**
- **Foaming at the mouth, vomiting, diarrhea, and hypotension→ Roundup (Glyphosate)**
- **Endocrine/reproductive disorders alongside general clinical signs→ Atrazine**

Treatment

•**No specific antidotes** available for herbicides.

•**Paraquat:** Fuller’s earth/Activated charcoal + Antioxidants (**NEVER give pure Oxygen!**).

•**2,4-D:** Forced alkaline diuresis (Sodium Bicarbonate) + Muscle relaxants.

•**Roundup:** Aggressive IV fluids (for hypotension) + GI protectants (**Avoid emesis** due to foaming/aspiration risk).