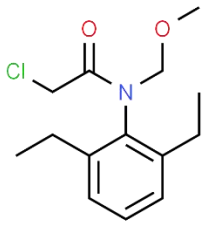
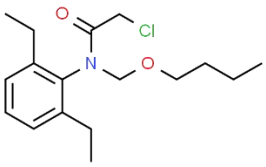
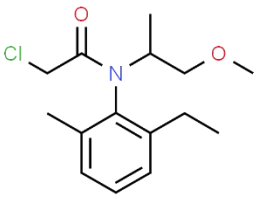
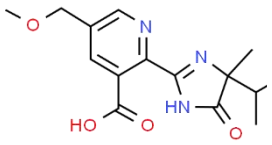
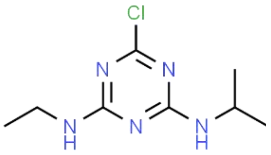
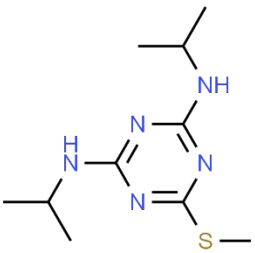
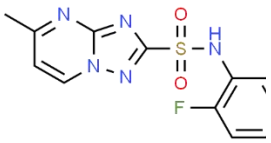
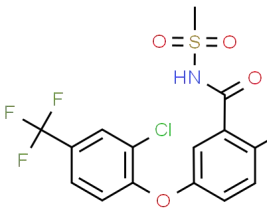
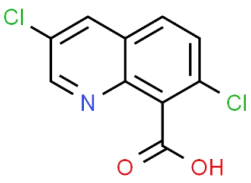
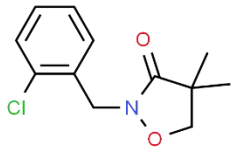
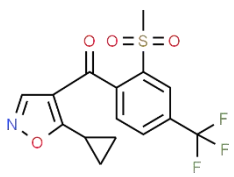
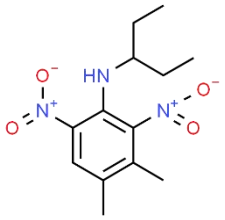
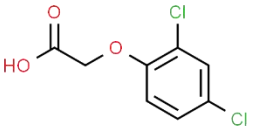
Table S1 Overview of herbicides

Herbicide	Chemical structure	Type	Action mechanism	Application place	Target plant categories
Alachlor		Amide	Selective pre-emergent herbicides, plant shoots absorb agents, inhibits the activity of proteases, and hinder protein synthesis HRAC: 15	Soybean, cotton, sugar beets, corn, peanuts, rape fields, etc	Annual grass weeds such as *Echinochloa crusgalli*, *Eleusine indica*, *Digitaria sanguinalis*, *Setaria viridis*, *Brachiaria brizantha*, etc
Butachlor		Amide	Selective conductive pre-emergence herbicide, systemic conduction, inhibits and destroys proteases in plants and affects protein formation HRAC: 15	Rice, winter barley, wheat fields, etc	Annual grass weeds such as *Echinochloa crusgalli*, *Cyperus difformis*, *Cyperus iria*, *Leptochloa chinensis*, *Alopecurus aequalis*, etc
Metolachlor		Amide	Selective conductive soil treatment agent, plant shoots absorb agents, inhibits protease activity and disrupts protein synthesis HRAC: 15	Corn, soybean, rape, cotton, sorghum, wheat, vegetable fields, etc	Annual grass weeds such as *Digitaria sanguinalis*, *Echinochloa crusgalli*, *Eleusine indica*, *Setaria viridis*, *Leptochloa chinensis*, *Eragrostis pilosa*, etc
Imazamox		Imidazolinone	Inhibit Acetolactate Synthase (ALS), disrupts protein synthesis HRAC: 2	Soybean fields	Annual grass weeds and broadleaf weeds such as *Avena fatua*, *Echinochloa crusgalli*, *Setaria viridis*, *Alopecurus aequalis*, *Leptochloa chinensis*, *Digitaria sanguinalis*, *Commelina communis*, *Solanum nigrum*, *Abutilon*

					theophrasti, *Amaranthus retroflexus*, *Chenopodium album*, *Xanthium sibiricum*, *Amethystea caerulea*, *Stellaria media*, *Polygonum bungeanum*, etc
Atrazine		Triazine	Selective systemic conduction of pre- and post-emergence herbicides, mainly absorbed by plant roots, and conducts to plant meristem and leaves, inhibiting photosynthesis HRAC: 5	Corn, sorghum, sugarcane fields, woodlands, meadows, etc	Annual and biennial broadleaf weeds such as *Echinochloa crusgalli*, and turf grass weeds such as *Ruellia simplex*, *Xanthium sibiricum*, *Sonchus arvensis*, *Equisetum arvense*, *Digitaria sanguinalis*, *Plantago asiatica*, *Setaria viridis*, *Artemisia selengensis*, etc
Prometryn		Triazine	Selective systemic conduction herbicides, absorbed by root and conducted to the leaves, inhibiting photosynthesis HRAC: 5	Soybeans, peanuts, wheat, cotton, rice, sugarcane fields, etc	Annual broadleaf weeds, annual grass weeds, *Cyperus* and some perennial weeds, such as *Digitaria sanguinalis*, *Setaria viridis*, *Echinochloa crusgalli*, *Alopecurus aequalis*, etc
Flumetsulam		Sulfonamide	Systemic conduction herbicides, inhibits Acetolactate Synthase (ALS) HRAC: 2	Corn, soybean, wheat, barley fields, etc	Annual and perennial broadleaf weeds such as *Veronica didyma*, *Xanthium sibiricum*, *Solanum nigrum*, *Amaranthus retroflexus*, *Chenopodium album*, *Abutilon theophrasti*, *Catchweed bedstraw*, *Datura stramonium*, etc

Fomesafen		Diphenyl ether	Selective contact foliage-applied herbicide, active under light, inhibits protoporphyrinogen IX oxidase (PPO), blocks chlorophyll synthesis HRAC: 14	Soybean fields	Broadleaf weeds such as *Abutilon theophrasti*, *Amaranthaceae*, *Chenopodium album*, *Xanthium sibiricum*, *Acalypha australis*, *Bidens tripartita*, *Solanum nigrum*, *Portulaca oleracea*, etc
Quinclorac also cellulose syn		Organic heterocyclic	Auxinic herbicide，affects the hormone balance and works with receptor proteins HRAC: 4	Rice fields	*Echinochloa crusgalli*, *Oenanthe javanica*, *Sesbania cannabina*, *Monochoria korsakowii*, etc
Clomazone		Organic heterocyclic	Selective systemic conduction of pre-emergence herbicide, inhibits the synthesis of isoprene compounds and hinders the biosynthesis of carotene and chlorophyll HRAC: 13	Mainly used in soybean fields, also could be used for sugarcane, peanuts, potatoes, tobacco, corn, cotton, rice fields	Annual grass weeds and broadleaf weeds, such as *Echinochloa crusgalli*, *Setaria glauca*, *Digitaria sanguinalis*, *Eleusine indica*, *Solanum nigrum*, *Portulaca oleracea*, *Chenopodium album*, *Amethystea caerulea*, *Xanthium sibiricum*, *Abutilon theophrasti*, *Bidens triparta*, and also have effect on perennial weeds such as *Cirsium setosum*, *Cirsium japonicum*, *Sonchus arvensis*, *Equisetum arvense*, etc
Isoxaflutole		Organic heterocyclic	Systemic conduction herbicide, absorbed and transported through roots and leaves, and converted into biologically	Corn and sugar cane fields	Annual grass weeds and broadleaf weeds, such as *Abutilon theophrasti*, *Chenopodium album*, *Amaranthus retroflexus*, *Echinochloa crusgalli*,

			active diketonitrile in plants, inhibits 4-hydroxyphenylpyruvate dioxygenase (HPPD), affects carotenoid biosynthesis		*Digitaria sanguinalis*, *Setaria glauca*, *Ambrosia artemisiifolia*, *Kochia scoparia*, *Xanthium sibiricum*, etc
Pendimethalin		Nitroaniline	Contact soil treatment agent, mainly absorbed by plant shoots, young stems and roots, inhibits cell division in meristems	Rice, cotton, maize, tobacco, peanuts, vegetable fields and orchard crops	Annual grass weeds and broadleaf weeds, such as *Digitaria sanguinalis*, *Setaria viridis*, *Echinochloa crusgalli*, *Portulaca oleracea*, *Chenopodium album*, etc
2,4-Dichlorophenoxyacetic acid (2, 4-D)		Phenoxyalkanoic	Selective systemic conduction herbicide, absorbed by plant roots, stems, and leaves, transmitted to the growth point, destroyed the normal physiological functions of plants	Corn and wheat fields	Annual and perennial broadleaf weeds, such as *Descurainia sophia*, *Capsella bursa-pastoris*, *Chenopodium album*, *Catchweed bedstraw*, *Humulus scandens*, *Lactuca indica*, *Crisium arvense*, *Convolvulus arvensis*, etc