

Herbicide Symptoms in Dry Edible Beans

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Herbicides sometimes injure beans, but diagnosing the injury may be difficult. Weather, soil, diseases, and insects contribute to bean injury from herbicides or induce symptoms similar to herbicide injury. It is often impossible to find a direct relationship between crop injury symptoms and a specific herbicide, or to estimate yield effects. Careful consideration of all contributing factors is needed to diagnose suspected cases of crop injury.

Most often, "herbicide injury" is seen as stunted, malformed, or slow-growing plants. It usually results from errors in application, drift of herbicides from adjacent fields, or residues of herbicides in the soil. Injury patterns in the field may correspond to soil types, equipment movement, prevailing winds, or injury to other susceptible plants. Comparisons of bean stands, appearance, and yield between affected and unaffected parts of a field are needed to assess damage.

Injury symptoms pictured in this publication occurred in production fields or were induced by excessive rates of application. The symptoms pictured are representative of a herbicide or group of herbicides, but symptoms may vary considerably, depending on the stage of crop development and growing conditions when the injury occurred.

9. Normal plant compared to dinitroaniline-affected plants.



10. Oxyfluorfen. Leaf crinkling and malformation, preemergence.



13. 2,4-D. Stem callous.



14. Glyphosate. Leaf chlorosis.



(See descriptions on back)

1. Normal bean leaves.



2. Alachlor. Leaf crinkled.



3. Chloramben. Root proliferation, delayed germination.



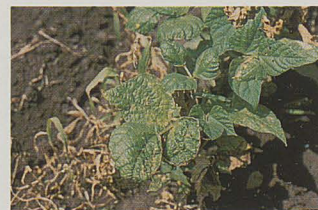
4. Dicamba. Leaf cupping.



5. Dicamba. Leaf blistering, malformation.



6. Paraquat. Dead spots on leaves.



8. Trifluralin. Swollen hypocotyl, short, stubby roots, stunting.



7. Paraquat. Leaf desiccation.



11. Acifluorfen. Leaf crinkling, postemergence.



12. 2,4-D. Stem twisting, leaf distortion.



15. EPTC. Leaf crinkling.



16. Atrazine. Marginal yellowing.





**CHEMICAL GROUP
AND HERBICIDES**

SYMPTOMS

<p>Acetanilides alachlor (Lasso)* metolachlor (Dual) propachlor (Ramrod/Bexton)</p>	<p>Acetanilides are absorbed by roots, shoots, and seeds and translocated to all parts of the bean plant. Symptoms are a shortening of the leaf midvein, causing the bean leaf to appear crinkled and heart-shaped (2)**, or inhibition of early seedling growth.</p>
<p>Benzoics chloramben (Amiben)* dicamba (Banvel)</p>	<p>Chloramben is absorbed by seeds and roots and is not translocated. Chloramben remains in the roots of seedlings and causes a proliferation of short, stubby roots. Bean shoots are stunted but not malformed (3). Dicamba is absorbed by leaves, stems, and roots and is translocated in the bean plant, accumulating in growing points. Dicamba drift has no effect on the roots of beans, but it causes leaf cupping, blistering, and malformation (4, 5). Symptoms may not be visible until 7 to 10 days following exposure to dicamba and will be evident on the new leaves.</p>
<p>Bipyridiliums diquat (Diquat) paraquat (Paraquat CL)</p>	<p>Bipyridiliums are contact herbicides that are absorbed by foliage and not translocated. Symptoms range from dead spots on exposed leaves to complete death and drying of the plant (6, 7) Symptoms are apparent within 24 hours of exposure.</p>
<p>Dinitroanilines dinitramine (Cobex)* profluralin (Tolban)* pendimethalin (Prowl) profluralin (Basalin) trifluralin (Treflan)*</p>	<p>Dinitroanilines are absorbed by roots and shoots of emerging bean seedlings and are not translocated in the plant. Dinitroanilines inhibit lateral root development causing short, stubby roots with enlarged tips, swollen hypocotyls, and stunting of the bean plant (8, 9). Injury to bean roots appears several days after germination.</p>
<p>Diphenyl ethers acifluorfen (Blazer) bifenox (Modown) diclofop (Hoelon) oxyfluorfen (Goal)</p>	<p>Bifenox and oxyfluorfen are absorbed by emerging bean shoots, while diclofop and acifluorfen are absorbed by bean leaves. Diphenyl ethers are not translocated in the plant. Diphenyl ethers have contact action causing leaf malformation, crinkling, and tissue death (10, 11). Cool, wet conditions and deep planting, which slow seedling emergence, increase the potential for injury from preemergence applications.</p>
<p>Phenols dinoseb (Premerge, Sinox General, Dow General)*</p>	<p>Phenols are absorbed by roots, shoots, and leaves. They have contact action and are not translocated in the bean plant. A preemergence application reduces root growth and distorts leaves. A postemergence application results in bean leaf drying and death. Symptoms occur within days after the roots, shoots, or leaves are exposed to the herbicide.</p>
<p>Phenoxy 2,4-D MCPA</p>	<p>Phenoxy herbicides are absorbed primarily by plant foliage, but root or stem absorption occurs. The phenoxy are translocated in plants and accumulate in growing points. Bean stems become twisted, brittle, branched, and/or develop callous tissue (12, 13). Leaves develop parallel veins, causing the interveinal tissue to become restricted and crinkled. Phenoxy symptoms are apparent within a few hours to several days after exposure and are usually caused by drift when nearby crops are sprayed.</p>
<p>Substituted Amino Acid glyphosate (Roundup)</p>	<p>Glyphosate is absorbed by bean foliage and translocated to all parts of the plant. Symptoms appear 3 to 7 days after exposure as yellowing (chlorosis) of new bean leaves (14). As the chlorosis progresses, bean plants wilt and plant tissue dies. Sublethal doses of glyphosate produce parallel leaf veins and proliferation of vegetative buds which are also symptoms of phenoxy herbicides.</p>
<p>Thiocarbamates butylate (Sutan Plus) EPTC (Eptam*, Eradicane) triallate (Far-go) vernolate (Vernam)</p>	<p>Thiocarbamates are absorbed by bean roots, shoots, and seeds and translocated in the plant. These herbicides cause cotyledons to enlarge, leaf malformation and crinkling, thickened dark green leaf tissue, and delayed seedling emergence (15). Symptoms are visible one to several weeks after application.</p>
<p>Triazines atrazine (several trade names) cyanazine (Bladex) metribuzin (Sencor/Lexone) simazine (Princep) <i>and</i> Ureas chlorbromuron (Maloran) chloroxuron (Tenoran) linuron (Lorox)</p>	<p>Triazines and ureas are absorbed by roots and leaves. They are translocated from roots, but there is little movement from leaves. Triazines and ureas cause yellowing and death of leaves by inhibiting photosynthesis. Symptoms occur first on older bean leaves as yellowing of leaf margins (16). Yellowing progresses inward to the midvein, followed by a gradual dying of the leaves. Symptoms occur 10 to 21 days after planting.</p>

*Registered for use
in dry edible beans.

**Numbers in parentheses refer to the pictures numbered on the reverse side.

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