

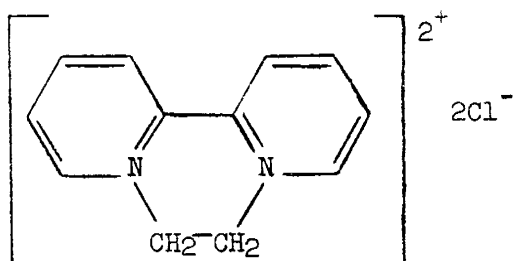
Diquat — Prospective Role In Aquatic Weed Control

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Diquat may be the answer to some of your present aquatic weed problems. Have you taken a look to see where it may help you in your weed control program? After a little background on Diquat as a chemical, we will see where it may fit your problem situations.

Diquat is a quaternary dipyrindyl compound which may be described as a potent water-soluble herbicide with a relatively broad spectrum of activity on plants, including floating and submerged aquatic weeds in which we are particularly interested at this meeting.

The structural formula for Diquat will be shown in the first slide. The portion enclosed in the brackets is the Diquat cation,



which is the active portion of the compound.

This may be formulated as various salts, such as diquat dichloride, which is the compound shown, or as diquat dibromide monohydrate, which was distributed earlier as ORTHO Diquat 4 Spray. This product contained 4 pounds of the salt per gallon and had a cation content of 2 pounds per gallon. The newer diquat dichloride formulation contains 2.8 pounds of the salt per gallon, but still has a cation content of 2 pounds per gallon. So you can see there has been no change in the active portion of the formulation.

The way in which Diquat kills plants is interesting. The herbicidal action appears to take place only during periods of photosynthesis, making light a necessary factor in the plant kill. This characteristic has been effectively used to reduce the normal dosage requirement by about one-third. For applications made after dark, or within two hours or less of sunset, less Diquat is needed since there is time during the dark for absorption and translocation of the material within the plant. The following day when light is present and photosynthesis is again started the plant begins to die rapidly. Applied during the daylight hours the systemic action of Diquat appears to be minimized by the very rapid kill.

You will probably now agree that Diquat is a very interesting compound, but if you have aquatic weed problems, you are more interested in knowing what it will do to control the weeds in your canals, ditches, lakes, or ponds and what weed species it will control.

Let us first look at the group classified as floating weeds. Diquat is recommended for control of waterlettuce (*Pistia stratiotes*), waterhyacinth (*Eichhornia crassipes*), and waterfern (*Salvinia rotundiflora*). It is also looking very good for control of duckweed (*Spirodela polyrrhiza*), but the most effective method of application has not been determined. There are also indications of good control of frogbit (*Limnobium* spp.) and water pennywort (*Hydrocotyle* spp.). The research work is continuing and the list of weeds controlled by Diquat is growing.

Diquat has several advantages over other herbicides for application to floating weed species.

1) Diquat is not volatile. There is no hazard from vapor drift; therefore, it may be used where the application of such volatile herbicides as 2,4-D would be a hazard to crop plants or residential plantings. When using Diquat, direct spray contact with the plants is necessary for kill.

2) It is less selective than most other materials now in use and is therefore more effective on mixed populations of weeds. Selective control of one species often allows another to take over very rapidly. This reinfestation

problem is minimized by Diquat through its broad spectrum of activity.

3) More rapid results can be expected from the use of Diquat. For instance, waterlettuce treated with 1 pound per acre of Diquat cation will be sinking in 7 to 10 Days, while the same weed treated with 16 pounds per acre of 2,4-D takes 8 to 12 Weeks to start sinking.

Now let us see what Diquat can do if submerged weeds are the problem. It is recommended for control of coontail (*Ceratophyllum demersum*), elodea (*Elodea canadensis*), pondweed (*Potamogeton* spp.), and southern naiad (*Najas quadalupensis*). Good results have also been obtained on bladderwort (*Utricularia* spp.). Here again, research work is continuing and the list of susceptible submerged plants is growing.

Diquat has a number of advantages over other herbicides for application to submerged aquatic weeds. Let us take a quick look at these advantages.

1) Diquat has a low toxicity to fish. Laboratory tests in Alabama and Illinois generally show the safe levels of Diquat to fish to be 2 to 4 times greater than the maximum dosage needed on susceptible submerged plants. Also, no fish mortality has been reported from field trials in Florida.

2) The mammalian toxicity level is greater than 400 mg. per kilo, or about the same as 2,4-D and 2,45-T. This means no serious handling problem to the applicators in the field.

3) Longer control periods can be expected. Tests have indicated slowed reinfestation and regrowth following Diquat treatments. This may be due to the systemic action of Diquat, resulting in a more complete initial kill than is the case of some chemicals with a more rapid action on submerged weeds.

4) Slower kill of submerged weeds. This may have the advantage of not depleting the oxygen supply as fast as a rapid killing herbicide may do. The speed of kill, however, appears to be associated with the water clarity and light transmission. Darker water slows the action.

5) Diquat is easy to handle and apply. It is water-soluble, which means there is no need for emulsifiers and bulky carriers. It is a potent chemical requiring a low relative volume of chemical to treat a given area. Also, no special training is needed to apply Diquat.

Present federal clearances are for use of Diquat in canals, lakes, and ponds with the limitation that treated water is not to be used for human or livestock drinking water and that the water should not be used for spraying or overhead irrigation for 10 days following treatment.

Some federally cleared uses of Diquat, other than aquatic weed control, include:

1) The killing of above ground weed growth around gardens, buildings, walkways, patios, fence lines, parkways, driveways, and other non-crop and non-planted areas.

2) Preharvest desiccation of sorghum, soybeans and alfalfa for harvest of seed crops only, and for desiccation of commercial plantings of castor beans to facilitate harvest.

We feel we have just scratched the surface of the potential herbicide and desiccant uses of this material. As new residue clearances are received we expect to see Diquat come into general use on cotton as a desiccant and defoliation aid. On soybeans, sorghum, sugar cane and other crops we can foresee uses as a desiccant and harvest aid chemical. We also expect to find other uses for Diquat as an agricultural herbicide.

As we have already pointed out, work on all types of aquatic weeds is continuing, and we expect to see many more weed species added to the list of those controlled by Diquat. We are supporting and encouraging more work on treatment techniques, dosage rates, formulations, additives and combinations. We feel that Diquat is going to have a big role in aquatic weed control.

Danger To Crop Plants From Herbicides Used For Aquatic Weed Control

By James Montelaro
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There is a real and constant danger to crop plants, not from the use, but from the misuse of herbicides in aquatic weed