S31
E22
no.83

LIBRARY
AUG 10 1962
AUBURN UNIVERSITY

Progress Report Series No. 83 May, 1962

Agricultural Experiment Station
AUBURN UNIVERSITY

E. V. Smith, Director
Auburn, Alabama

A SENSITIVE BIO-ASSAY for TWO BIPYRIDYL QUATERNARY SALTS

H. H. FUNDERBURK, JR., *Assistant Botanist*
J. M. LAWRENCE, *Associate Fish Culturist*

DETERMINATION of residues has become an important aspect of herbicidal research. Efforts are continually being made to increase the sensitivity of known tests for the chemical analysis of a large number of herbicides. Residues from aquatic herbicides are usually very small because the herbicide must be effective in small quantities (usually 1.0 to 5.0 ppm) to be economically feasible.

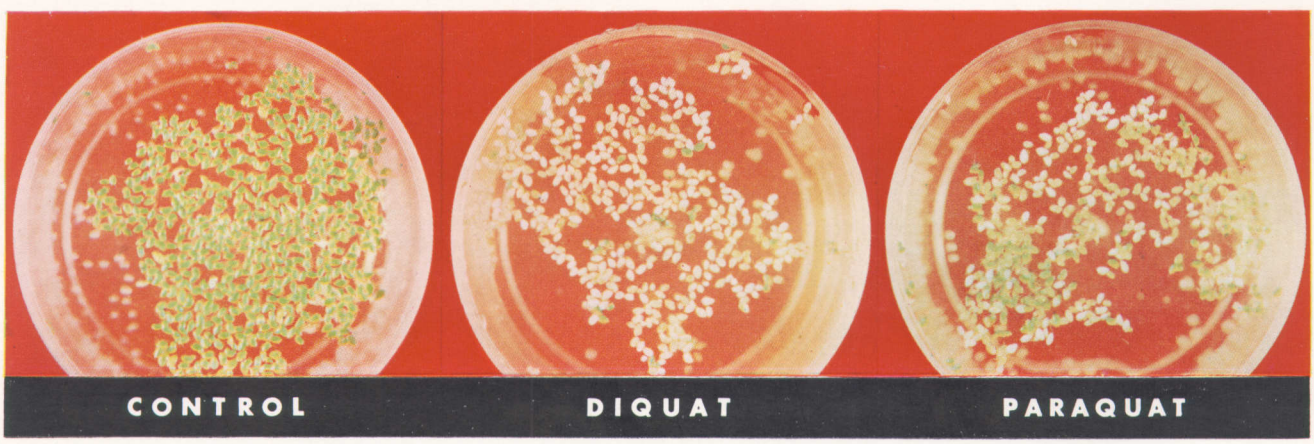
The compounds 1,1′-ethylene-2,2′-bipyridylium dibromide (diquat) and 1,1′-dimethyl-4,4′-bipyridylium di (methyl sulfate) (paraquat) are new herbicides that control a number of aquatic weeds at exceedingly low rates (0.5 ppm).

In preliminary experiments, it was noticed that these chemicals caused a general and finally a complete chlorosis of several aquatic weeds. One of the weeds that was completely bleached by these herbicides was duckweed (*Lemna minor* L[1]).

Duckweed was subjected to several rates of both herbicides and was found to be sensitive to concentrations below 0.1 ppm. Repeated experiments indicated that concentrations as low as 0.005 and 0.0075 ppm of diquat and paraquat, respectively, could be detected by assaying with duckweed.

The bio-assay is simple, of short duration (96 to 144 hr.), and it appears to be more sensitive than the chemical tests for these compounds. It is being utilized for the determination of residues of diquat and paraquat in water and plants. Plans are underway to adapt it to the determination of residues of these chemicals in soil and fish.

[1] Flowering material has not been observed. Samples of strain used will be mailed upon request.



The lesser duckweed (*Lemna minor* L.) provides a simple, sensitive bio-assay technique for determining concentrations of either diquat or paraquat in water or plant tissue. Cultures of duckweed are grown and maintained in covered plastic containers under 600 to 1,000 foot-candles illumination for 14 hours per day and at a temperature of 80° F. In each of the above treatments, the vessel was filled with dechlorinated tap water, and the duckweed was held in the experiment for 7 days. The vessel in the center contained 0.005 ppm **diquat** and the vessel on the right contained 0.0075 ppm **paraquat.** Higher rates of either chemical produced chlorosis of duckweed within a much shorter exposure period.