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Physiological variants amongst leafy spurge

DONALD GALITZ

North Dakota State University Fargo, ND 58105

Leafy spurge (*Euphorbia esula* L.) is a perennial weed which infests millions of acres of uncultivated land across the northern tier of the United States and Canada and which continues to spread in spite of present control practices. Its economic impact has become staggering because the costs of present control practices surpass economic returns of these marginally productive lands.

Vegetative differences amongst field grown leafy spurge plants have been observed and recorded. In some instances these differences have been due to environmental factors, for this plant is found to grow under widely diverse conditions. However, some of these differences are genetic and these different plant forms have been termed "Biotypes" or "Ecotypes". Several investigators are conducting research on spurge plants which have been propagated from some of the same original stock biotypes collected and grown in nurseries for experimental purposes. Such stock plants have been characterized, their origin noted and have been assigned "Accession numbers" for reference purposes.

Proposed system 0001-0100

A. Numbers 1-100 are reserved for the collection originally made by Dr. Melvin McCarty and maintained at Lincoln, Nebraska from 1978 to 1983. This material has been described in detail by Ebke and McCarty, Weed Science, 31(6):861-865, 1983.

   This material has been removed from Nebraska and is being maintained in outdoor nurseries at Fargo, North Dakota and Bozeman, Montana.

B. Numbers 101-200 are reserved for the North Dakota collection initiated by Dr. Donald Galitz and currently maintained by the Agronomy Department, North Dakota State University, Fargo, N.D.

C. Numbers 201-300 -Montana collections 0201-0300

D. Numbers 301-400 –Wyoming collections 0301-0400

E. Numbers 401-500 -Washington collections 0401-0500

F. Numbers 501-600 -Utah collections 0501-0600

G. G. Numbers 601-700 -South Dakota collections 0601-0700

H. H. Numbers 701-800 -Idaho collection 0701-0800

I. I. Numbers 801-900 -Oregon collection 0801-0900

J. J. Numbers 901-1000 Collections from other 0901-1000

1001 -1100 States as needed 1001-1100

1101-1200 -

etc.

to 2000

K. Numbers in the 2000 range will be reserved for collections from Canada.

2001-2100 British Columbia

2101-2200 Alberta

2201-2300 Saskatchewan

2301-2400 Manitoba

2401-2500 Ontario

2501-2600 Quebec.

Vegetative characteristics which appear to vary from biotype to biotype include leaf surface area and the number and distribution of stomata on both adaxial and abaxial leaf surfaces. It has also been observed that biotype 0007 (collected near Weiser, Idaho) is extremely sensitive to a powdery mildew, a couple others are slightly susceptible, while the rest of the biotypes are apparently resistant to this mildew.

Rooting propagules were used to study the relative sensitivities of biotypes to different herbicides. Varying degrees of response were observed amongst biotypes but questions regarding the quantities of herbicide taken up by each biotype, because of differences in leaf characteristics, made interpretation difficult.

Consequently tissue culture techniques were employed to obtain data on the relative susceptabilities of different spurge biotypes to dicamba treatment. Cell suspension cultures were obtained from callus tissue formed by young spurge stem segments that were grown on a commercial B5 culture medium containing lppm 2,4-D. Dicamba, at final concentrations of 10^{-9}, 10^{-6} and 10^{-3} molar, added to the culture medium proportionately decreased growth of the cell suspension cultures during a 15 day growth period. At 10^{-3}M there was 100% inhibition of cell suspension growth. Although growth curve responses to dicamba concentrations were not significant till 5 to 6 days growth after subculturing, metabolic indicators of herbicide stress exhibited responses at 2 to 3 days after treatment. Primary effects observed were decreased protein, total acid soluable nucleotide and ribonucleic acid content of the cultures as expressed on a per gram fresh weight basis. Nitrate is the primary nitrogen source for cells growing on a B5 medium and the activity of the enzyme nitrate reductase was shown to decrease as the dicamba concentration of the medium increased. No change in the conductivity of the nutrient medium of dicamba treated cells was observed indicating little change in cell membrane function with dicamba treatment. Low concentrations of the herbicide stimulated while high concentrations inhibited the generation of ethylene by the spurge cultures. At this time no evidence of

dicamba degradation or metabolism by the cultures has been defected. Response curves indicate as much as ± 50% variation in the sensitivity of cultures from different spurge biotypes when treated with dicamba.

Cell suspension cultures have provided a mechanism for studying the cellular basis for the response of a plant species to herbicide treatment and has generated additional evidence supporting the concept that there are genetic differences between biotypes.