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COOPERATIVE EXTENSION SERVICE COLORADO STATE UNIVERSITY

ALVIN L. YOUNG

the Weeds

COOPERATING WITH U.S. DEPARTMENT OF AGRICULTURE

Colorado Extension Service
Number 45

Fort Collins, Colorado
October 1970

COLORADO WEED CONTROL CONFERENCE
Student Center Building-CSU, Fort Collins, Colorado
November 18 and 19, 1970
Put This on Your Calendar - Hope You Can Attend

PESTICIDES, FOODS AND BALANCE OF NATURE

We hear a great deal about upsetting the balance of nature and that man's survival hangs on the preservation of this balance. There are some self appointed experts who put much of the blame for this unbalance on pesticides. These experts enjoy seeing their names in print with articles that say that because pesticides are poisonous, we are in danger of poisoning our food supplies and contaminating the environment we live in. There is probably nothing further from the truth as far as pesticides are concerned. In most cases these statements are based on emotionalism and not scientific facts.

Market basket surveys made during the early 1960's showed conclusively that pesticides were not endangering food supplies. When the food argument fell flat, these "experts" shifted their emphasis to the environment and wild life; here they knew it would be harder to prove them wrong and get documentary evidence like the market basket survey, but it seems coincidental that if harmful pesticides could not be found in abundance in foods or agricultural products where pesticides are most widely used, that one would expect to find high concentrations in wilderness areas.

There is not one medically documented incidence of ill health in man, not to mention death, that has positively been attributed to residues of pesticides in food when applied in accordance with label directions. The pesticide industry is proud of this fact. This is why the Ribicoff Committee wrote, "The food supply of the United States is the envy of the world, and the critical assurance that these abundant crops can be profitably grown, harvested and stored, is due to pest control, at present largely with chemical pesticides". During the period pesticides have been used most extensively, the general health in this country has far exceeded anything previously, and life expectancy has increased considerably during the same period.

Pesticides are not judged on the same basis as other chemicals we use and consume daily. Drugs are prescribed by physicians at a level that is believed to be safe; at 10 or 100 times this level, many of these same drugs would be highly poisonous to the patient. But when considering pesticides, many people think that if a chemical is toxic at any fictiously high level, it is toxic at all levels. For example, flouride at low levels in drinking water is considered beneficial in preventing tooth decay, at high levels it is toxic. The restriction on cyclamate was based on tests that showed that at high levels this additive induced cancer in rats. But a human being would have to drink 300 to 600 bottles of a cyclamate beverage, depending on brand, at one time, to equate the consumption by the rats.

It seems right that the pesticide industry is proud of this record. It is one of the most tightly regulated industries in the world. Years of research and experimentation under vigorous testing requirements, both in the laboratory and in the field, under the scrutiny of the States, USDA and HEW, must go into each and every pesticide before it is allowed to be marketed. Before a pesticide is approved for use, there must be positive evidence that:

1. It will not result in hazard to the user or to the consumer of the treated commodities. A minimum 100-fold safety margin is used.

2. It will not cause injury to crops or objects to which it is applied or to beneficial animals that are exposed.

3. It will provide the pest control that is claimed on the label.

4. There is no tolerance allowed for residues of chemicals that might induce cancer.

What would happen if the anti-pesticide interest in the country won out and herbicides, insecticides and fertilizers were outlawed? The production of food would be so severely interrupted that other world problems would seem incidental. Without the use of herbicides, insecticides and other pesticides, the average American family who now spends about 16½¢ of every dollar brought home, would have difficulty feeding a family for three times that much. In addition, the quality of food would not be acceptable. Without pesticides, yields of crops and livestock would drop at least 50% and food cost would undoubtedly increase by four or five times.

In India where pest control is used very little, over 50% of the food produced from their very low yields never reaches the consumer, because of insects, decay or destruction by vermin. This would also have a serious effect on the status of wild life and recreation areas. If there was a critical shortage of land for food production, it should be obvious that land set aside for wild life and recreation would rate second.

Without pesticides there would be many food products that could not be raised commercially. At the turn of the century, the average national production of potatoes was about 40 cwt per acre; in 1945 it had increased to 84, and in 1963, the yield had risen to 202 cwt per acre largely due to the

development of insecticides and fungicides. Since World War II, 35,000,000 acres have been removed from agricultural production and much of this has been high productive truck gardening land that has gone into urbanization. Today only 7% of the total population is engaged in the production of food and fibre. The high standard of living we enjoy in the United States can be largely attributed to the fact that this small portion of the total population is needed to produce the food we eat. Effective use of pesticides has been a major factor in the efficiency of U.S. Agriculture.

PESTICIDES SAVE LIVES: A little over 20 years ago, about 200 million people were stricken with malaria annually with 2 million deaths resulting. Now about 40% of the world population is in malaria free areas and another 39% lives in areas protected by active DDT control programs. In 1953 there were 75 million cases of malaria in India and the life expectancy for Indians was 32 years. By 1962, 147 million lbs of DDT had been used, and the life expectancy had jumped to 47 years. By 1967, there were fewer than 100,000 cases of malaria in India.

During the year 1965, there were 81 cases of malaria reported in the United States. This figure compared with the 500,000 cases contracted by U.S. troops during World War II; 40,000 cases during the Korean war and 600 cases during the first ten months of 1965 in Vietnam, is dramatic illustration of the need for control measures.

During the summer of 1965, there were 82 cases of encephalitis in humans - two of these deaths were in Colorado; had not extensive mosquito control programs been carried out, the number of encephalitis cases in Colorado may have reached epidemic proportions. The State of Colorado, under the direction of the Colorado Department of Agriculture, sprayed 194,000 acres for mosquito control along the flood plain of the Platte and Arkansas rivers, and approximately the same numbers of acres were sprayed by various counties and city agencies. There were no laboratory confirmations of injury or death to fish or wild life as a result of this program.

Those who would advocate doing away with pesticides for controlling forest insects because of possible harm to wild life, need only to visit some of the areas where insects have destroyed entire forests. Had it been possible to have treated these areas by mass pesticide spraying, the forests would have been saved and the incident of detrimental effects to wild life would have been negligible. Once a forest is destroyed, it takes 100 years or more for it to revegetate and the wild life populations to reestablish to the proportions they were before the forest was destroyed.

CROP YIELDS HAVE INCREASED: In the past three decades, crop yields have increased 30 to 40 percent; much of this can be contributed to proper use of pesticides. We hear publicity about agricultural surplusses, but this only represents about 4% of our agricultural output which is not much of a safety margin. Warren Shaw, USDA, says that without pesticides, agricultural exports would be eliminated. These exports amounted to 7.4 billion dollars in 1967, or 24% of our total export income.

WHAT CAN BE DONE: We must all make a greater effort to inform the public. Many of the people who know the truth about pesticides, hesitate to speak out in the hostile atmosphere. Much of the criticism is based on emotionalism, not

facts, and is for the sole purpose of gaining personal attention. We must try to make the public aware of the facts, and that if pesticides are banned, they stand to lose much more than they realize. The public should understand that pesticides are largely responsible for the high standard of living we now enjoy.

No one will argue that pesticides can be dangerous if used wrong but this does not mean that all pesticides are used wrong, in fact, it is more rare than common. Just because a pesticide is toxic at 1000 times the normal dosage, does not mean that the normal dosage is a hazard to society. People must understand that benefits far outweigh the risk.

READ THIS BEFORE EATING YOUR NEXT MEAL

Last spring I wrote an article on the toxic properties occurring in foods; I said that many of the foods we consume daily would not be permitted for sale if their toxic properties were judged on the same basis as pesticides. Pesticides are declared hazardous to man and withdrawn from the market if through laboratory tests they are shown to be toxic at almost any high level. Many of the foods we eat contain chemical substances known to have toxic properties, but we eat these foods with no observable adverse effects because intake levels are too low. A recent article by Dr. Richard L. Hall, Vice-President for Research & Development of McCormick & Company, told a Seminar how the various items on a food menu would be regarded if analyzed on the same basis as pesticides.

Radishes, carrots, celery and particularly potatoes would probably be struck from the menu because these contain cholinestrerase inhibitors which interfere with the transmission of nerve impulses; many modern pesticides are based on such activity. The alkaloid solanine in potatoes is often present with less than a 10 fold safety factor between the normal level and levels that cause human poisoning. Pesticides are required to have at least a 100 fold safety factor.

Almonds and lima beans could not be served because they contain glycosides which break down during cooking or digestion to yield hydrogen cyanide. Lima beans high in HCN has been the cause of several poisoning outbreaks. Oxalates and free oxalic acid occur in spinach, cashews, almonds, cocoa and tea.

Nutmeg contains myristicin; myristicin is a hallucinogen (causes mental disorders). Nutmeg also contains small quantities of safrol, a carcinogen (substance that produces cancer).

Goitrogens (substances which promote goiter) are present in the white turnip, cauliflower, peach, pear, strawberry, brussel sprouts, spinach and carrots as well as other foods. Pressor amines (substances which raise blood pressure) are common and present in bananas, pineapples and cheese.

Several vitamins - A, D, and K - and several essential minerals, could not be tolerated at levels of 100 times normal consumption, the levels that have been applied in evaluating pesticides. So, the Vitamin D and A in egg-yolk and butter, the D in milk and zinc in seafood would rule them out. Besides egg yolk has been found to be carcinogenic in the diet of mice.

Nitrite or nitrate contents of foods have proven capable of causing methemoglobinemia in man (a crystalline substance to form in the blood) and they also can be transformed in the stomach into potent carcinogens. Smoked foods contain small amounts of polynuclear aromatic hydrocarbons, which are indicated to be carcinogens.

The rolls on the menu could be retained if the ricket-promoting factor in yeast and hazards of amino-acid unbalance was ignored. Obviously the menu would be pretty bare if the toxic properties of foods were judged on the same basis as pesticides.

RUSSIAN KNAPWEED IDENTIFIED AS PLANT CAUSING CHEWING DISEASE IN HORSES

Drs. William W. Brown and Stewart Young, Pathology, and Professor Bruno Klinger, Botany, CSU, have identified the plant that causes "Chewing Disease" in horses in Colorado. They have experimentally reproduced the disease in three horses by feeding them a diet consisting mainly of Russian Knapweed.

For many years, horse owners and practicing veterinarians in Northern California have observed this disease. There, it is caused by yellow star-thistle. Recently, clinical cases of the disease have been identified at the CSU Veterinary Hospital. Most of the affected animals have come from the Western Slope of Colorado. It was found that Russian Knapweed was abundant on these ranches where the disease had occurred. The horses had grazed the plant, which is related to yellow star-thistle.

One of the most characteristic signs of chewing disease is a partially open mouth with a protruding tongue. The animal is unable to chew and swallow properly and is often unable to drink except by submerging its mouth and nose in a bucket.

The clinical signs of chewing disease are attributed to the presence of very specific degenerative lesions in the substantia nigra and globus pallidus of the brain, the veterinarians said. The nerve cells and supporting tissues of these centers are selectively destroyed and their place is taken by accumulation of cellular debris that soon liquifies to leave a cyst. At present a severe case of the disease is not curable. Most affected horses die from a combination of starvation and brain damage.

I have heard farmers and ranchers say that Russian Knapweed was good pasture and they were not concerned with getting rid of it. Anyone who has chewed a leaf of Russian Knapweed and knows its bitter taste, would question the value of this plant as a livestock feed, unless livestock have a different taste mechanism than we do. Maybe these findings in regard to its effect on horses will make some people more concerned about it.

CONTROL OF WEEDS IN ALFALFA

In the spring I receive inquiries about control of weeds in established alfalfa and what herbicides can be used in new seedings. Since the herbicides that are registered for use in established stands of alfalfa should be applied in late fall or before January 1, information at this time is appropriate.

Alfalfa is the most extensively grown cultivated crop in Colorado and exceeds all other cultivated crops in value. In 1965 and 1966 there were 765,000 acres harvested with an average production of 2.55 tons per acre. During this same period there were 14,000 acres of alfalfa seed grown with the production of about 2,000,000 lbs or 130 lbs per acre.

Farm management people say it costs $60 to $80 an acre to produce alfalfa in Colorado. If a crop sells for about $25 per ton baled, a 2 ton yield fails to pay the cost of production. The average of 2.55 tons per acre will just about break even, which means that about half the farmers in Colorado are growing alfalfa at a loss. One of the major reasons for low alfalfa yields is crop competition caused by annual and perennial weeds. Weedy hay is also discounted $8 to $10 per ton and buyers are becoming increasingly conscious of hay quality.

The major weeds in alfalfa are winter annuals - weeds that germinate in the fall or through the winter and emerge early in the spring, making rapid growth in early spring or before alfalfa breaks dormancy. Some of the major weeds are tansy and blue mustard, cheatgrass, wild salsify, dandelions and barnyardgrass. Perennial weeds that are especially troublesome in alfalfa are perennial foxtail (Hordeum jubatum) and quackgrass. Except for barnyardgrass, these weeds are most troublesome in the first cutting.

HERBICIDES IN ESTABLISHED ALFALFA: Princep (simazine): Simazine has provided effective control of certain annual and perennial broadleaf and grass weeds. It should be applied broadcast in fall after the first killing frost, before the ground permanently freezes, before January 1, to alfalfa established at least one year. Use 1 to 2 lbs of Princep 80W per acre in a minimum of 18 gallons of water per acre. Do not use on sandy and loamy sand soils. Alfalfa may be actively growing, semi-dormant or dormant when simazine applications are made. The cost of this application will vary around $3.50 per acre which should easily be returned from improved yield and hay quality. Do not apply simazine in the fall and then spring plow and seed to a sensitive crop the following season.

Application of simazine to alfalfa may result in temporary chlorosis, but the crop usually recovers with no adverse effect. Do not apply on the snow, and make only one application a year. Applications made to alfalfa growing on alkali soils, or where cuts or erosions have exposed calcareous sub-soil may result in crop injury. Avoid over-lapping and shut off sprayer while making turns. Do not graze treated areas for thirty days or cut hay for sixty days after treatment.

Simitol (GS-14254): This is an experimental triazine that has been tested in Colorado for three seasons for weed control in alfalfa; it has looked good in most areas. Label approval for this product is expected by next season. It appears to have better crop selectivity than simazine and is considerably more soluble and should not carry over as long in the soil as simazine. Rate of 1 and 2 lbs per acre ai. have been tested with no crop injury.

Several other herbicides have been tested in Colorado but none of the registered materials have given acceptable weed control.

NEW SEEDINGS: Better stands are usually obtained when alfalfa is not seeded with a nurse crop. One study showed that when alfalfa was seeded alone after an application of EPTC for weed control, hay yields were over 7000 lbs per acre greater over a three year period, than when alfalfa was seeded with grain as a companion crop.

EPTC (Eptam): Eptam must be incorporated into the soil within minutes after application; whenever possible, spraying and soil incorporation should be done in the same operation. Soil incorporate the herbicide 2 to 4 inches deep. Plant immediately after application. Temporary crop stunting and sealing of the first leaves may occur if conditions for germination and growth are not optimum. Use 3 lbs ai. of Eptam per acre. Do not graze or harvest for feed within 14 days after application.

DCPA (Dacthal): Dacthal is registered for alfalfa grown for seed purposes only. Apply Dacthal to the soil surface at time of seeding before weed seeds germinate. Do not graze treated areas or feed the forage to livestock.

POSTEMERGENCE HERBICIDES: There are several herbicides that can be used to control weed seedlings after emergence. 2,4-DB can be applied to seedling alfalfa when weeds are less than 3 inches high. This has been tested and used in Colorado with only mediocre success. In most cases it controls annual weeds if applied at the right growth stage, but it has also caused significant stunting of the alfalfa in some cases and thinned the stand; usually the crop recovers from the set-back. One-half pound ai. per acre appears to be the maximum rate alfalfa seedlings will tolerate. This will usually control seedlings of Russian thistle, pigweed, kochia, and some other annual broadleaf weeds. It does not control grass weeds. Do not graze livestock on or cut hay from treated fields within 30 days after application.

CHARCOAL TO DEACTIVATE HERBICIDES

I often get questions about what can be done to deactivate herbicides in soil. This sometimes comes up with respect to misuse of soil sterilant compounds in urban areas, or soil treated with atrazine when a farmer may want to grow a crop other than corn or sorghum. There is no positive answer; charcoal (carbon) has the ability to absorb herbicides and it can be used to protect crop plants, but there is no assurance that it will work under all conditions. Its effectiveness will vary with herbicides and amount in the soil, and with soil types and condition of the soil. There has been research done with activated charcoal to protect crop plants from herbicide applications and to reduce the toxic residue in the soil.

OREGON: This was a greenhouse study using activated charcoal, Aqua Nuchar A, the herbicide was Diuron. Band treatments were applied over grass seedings, planted at various depths. Seed planted ½ inch deep received the least protection from the charcoal. Higher rates of charcoal were needed on sandy loam soils than on heavier soils. Activated charcoal @200 to 300 lbs per acre gave good plant protection.

PURDUE UNIVERSITY: An activated carbon/vermiculite mixture was tested for increasing herbicide selectivity. This was done in the greenhouse and in the field. Several crops were used. One pound of activated charcoal was mixed with three liters of vermiculite. This mixture was applied 3/4" deep and 1" wide over the crop seed. Neburon and simazine were used as herbicides. There was reasonably good protection when 2 lbs of simazine or 12 lbs of Neburon per acre was used.

There are other studies, but it appears that a ratio of about 1:300 lbs - sometimes more, should be considered to deactivate an herbicide in soil. In other words, it would take at least 300 lbs of activated charcoal per acre, mixed in the root zone area, to protect against 1 lb of herbicide per acre. Activated charcoal is difficult to get into suspension and to hold in suspension. A surfactant @.3% by volume will make it easier to get the charcoal in suspension and hold it there. Surfactants such as X-77 and surfactant WK have been used.

It probably isn't practical to treat large fields to deactivate herbicide residues such as atrazine, but it may be practical to treat small areas such as lawns or where shrubs or trees are to be planted. Thorough mixing of the charcoal in the soil is very important.

MUSK THISTLE (Carduss nutans)

This summer I saw more Musk Thistle in Colorado than in other years. The larger infestations are in northeastern Colorado but it seems to be moving south. In Nebraska and Kansas it is considered one of the more troublesome weeds. We should be using every means possible to keep this weed from becoming widespread in Colorado. It is obvioulsy spreading in Colorado and will continue to unless we take positive action to hold it in check. It is an extremely prolific seed producer and is well equipped to spread rapidly. A Nebraska study using 50 plants reports there were 3,199 potential Musk Thistle seedlings from 9,235 seeds from one plant. These seeds are primarily distributed by wind.

Musk Thistle is a native of the old world; it invaded North America about fifty years ago. It was reported in Kansas in 1948 and since then about half of the counties in Kansas including the northwest counties have become infested to some extent. Musk Thistle was declared a noxious weed throughout Kansas in 1963. Kansas law requires that all persons and organizations prevent the spread of it and eradicate it on all lands owned or supervised by them.

Musk Thistle is also of serious importance father east; it poses control problems in at least forty western Virginia counties. In one study it was found that one Musk Thistle plant on each 16 sq. ft. of pasture land, amounting to a somewhat mild infestation of 2,722 plants per acre, reduced dry forage yields an average of 23% - over 570 lbs per acre.

Musk Thistle or nodding thistle is usually a biennial or winter annual but it has been observed as a summer annual. As a biennial or winter annual, it produces a rosette the first year and develops flowers and seeds the second year. Musk Thistle plants vary in height from a few inches to over 6 ft., depending upon soils and growing conditions. A large plant has a large fleshy taproot which is corky and hollow near the ground surface.

CONTROL: Scattered plants should be removed by digging below the crown, in the rosette stage, to prevent further development of the plant and seed formation. More mature plants that are in late bud or bloom stage, should be cut off below the ground level, piled and burned. Several mowings are necessary during a season for effective control.

2,4-D @1½ to 2 lbs acid equivalent per acre will control Musk Thistle. Apply before flower stocks lengthen in the spring or use as a late fall treatment on rosettes. Other chemicals have been tested but they have proven no more effective than 2,4-D. More than one treatment per year may be necessary. Annual applications may be necessary for control of new seedlings. Apply 2,4-D in 20 gallons or more of water per acre for ground application. Plants growing rapidly under good soil moisture conditions and favorable temperatures, (70 to 90 degrees F.), are most easily killed with 2,4-D.

SOME REASONS FOR POOR CONTROL: In heavy infestation, rosettes may be covered with other growth and may not be contacted by the herbicide. Low spray volume can result in poor spray distribution and coverage of thistles. Dry soil or cool temperatures can result in little or no translocation of the herbicide. Musk Thistles treated at stages later than the recommended stage, can result in less effective control. Improper calibration and adjustment of equipment may result in incomplete spray coverage or excess application. Improper speed or pressure of the sprayer can result in improper rate of application.

A BLADE OF GRASS

Some of the scare mongers have said that because of pesticides, we are endangering our oxygen supply by the possible reduction of plankton in the ocean. I am not worried about this but maybe it will make some people more willing to grow and maintain an attractive lawn.

A blade of grass, in its growth process, takes polluting gases from the air and returns pure oxygen. In a season of active growth, the grass in a well maintained lawn, 50 x 50 ft., liberates enough oxygen to meet the needs of a family of four day after day. Also, while performing this miracle it provides the basic food supply for animals and man. It does this by photosynthesis, using the energy from the sun to turn carbon dioxide, water and minerals into green growth.

Every lawn owner is making a worthy contribution to the environment by maintaining this life sustaining greenery.

SURVEY OF 2,4-D RESIDUE IN MEAT

A biological residue survey of 2,4-D was conducted from August 17 through August 30, 1969 in cattle slaughtered in nine federally inspected establishments located in Minnesota and South Dakota. A total of 32,848 cattle were slaughtered in these establishments during the time samples were collected, from 15 animals from Minnesota and 35 animals from South Dakota. None of the samples collected and analyzed showed detectable 2,4-D residues even though the livestock samples were taken from an area where large quantitites of this herbicide was used.

TURF GRASS INDUSTRY SURVEY

This survey was conducted by the Western Washington Research and Extension Center, Washington State University. It covered the State of Washington for the year 1967. The information in this survey could be valuable in many ways; you may want to read the complete article in LAWN & GARDEN, August 1970.

There was a total of 41 tables in this survey; one table that was of particular interest was entitled, "Most Common Turf Problems", this is shown below.

MOST COMMON TURF PROBLEMS
Ranked in order of Importance*

PROBLEM	HOME LAWNS	GENERAL TYPE LAWNS	GOLF COURSE FAIRWAYS	SCHOOL LAWNS
Weeds	1	1	1	1
Wear	5	3	2	3
Poor Drainage	6	6	3	5
Poor Soil	2	2	4	2
Compaction	5	3	5	3
Thatch	8	8	7	7
Disease	3	4	8	6
Insects	3	4	9	6
Shade	7	7	10	8
Other	4	5	6	4

*Ranked in Descending Order--1 is most important;
10 is least important.

Weeds were considered the number one problem in all lawn categories.

Extension Agent

Eugene Heikes
Extension Professor
Weed Science-Botany