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California AGRICULTURE

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Irrigated Pastures May Be Favorable to Livestock Parasites

M. A. Stewart

Certain internal parasites inhabit and reproduce in the bodies of sheep and cattle. The young, undeveloped parasites, excreted by the animal, find conditions in irrigated pastures well suited to their development.

Conditions Fostering Development

Irrigated pastures provide moist conditions and even temperatures at the base of plants where parasites thrive.

The plant growth protects the immature parasites from the drying effects of direct sunlight.

More animals per acre are carried on irrigated pastures than on non-irrigated lands, so the parasite population is higher.

Irrigated pastures are commonly used for young animals, which are more susceptible to parasites than are older ones, and consequently are greater carriers.

Control Measures

In spite of these dangers, irrigated pastures can be used to advantage if the operator will take certain routine measures to suppress parasites and prevent infection.

Coccidiosis. This disease is produced in sheep and cattle when the wall of the intestine is invaded by small one-celled parasites belonging to the genus **Eimeria.**

The most constant symptom is "bloody scours." Certain other conditions may produce similar symptoms but when such scours occur, coccidiosis should be suspected and a definite diagnosis should be made by a competent person.

Prevention is best assured by determining, as far as possible, that animals purchased come from "clean" ranches. When this is not known, the new animals, especially the young ones, should be quarantined for approximately two weeks before they are placed with other stock.

Under feed-yard conditions, infections in lambs may be prevented by mixing ground crude sulfur with the feed.

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Seek Answers to Nitrogen Needs of Orchards in State

E. L. Proebsting

A high percentage of the peach orchards in California need nitrogen; a low percentage of the pears and prunes need it, and the other fruits and nuts fall in intermediate positions.

Properly used, a pound of actual nitrogen gives about the same response whether from manure or commercial fertilizer, and irrespective of whether it was given as a nitrate compound or as an ammonium compound. There might be secondary effects due to the form used, but generally, nitrogen from any standard source is satisfactory.

Time of Application

The time of application is a question involving more qualifications to the answer. In earlier studies, two situations were observed.

In one, an adequate amount of nitrogen was given annually to maintain a satisfactory level. Time of application was a minor factor after the first year.

In the other situation, encountered chiefly in shipping fruits where a moderate level is desired to encourage early maturity, timing is of much greater importance.

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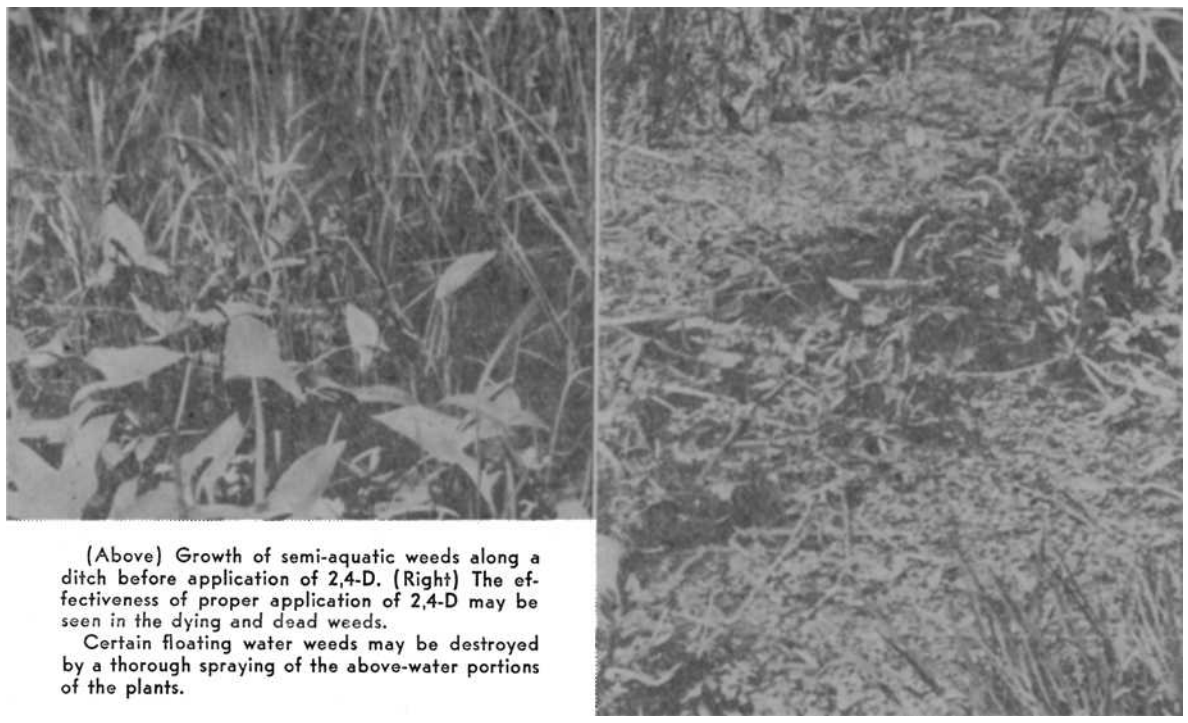
2,4D Valuable as Weed Killer When Properly Used But Can Be Detrimental To Soil and Crops if Mishandled

W. A. Harvey

Available in dry powder form and as liquid preparations the commercial 2,4-D is readily dissolved or emulsified in water to form a spray solution to be applied in sufficient volume to get distribution of the chemical to all the weeds.

Applications by airplane may require only 15 gallons of concentrated solution per acre, while a field sprayer may apply 100 to 200 gallons per acre of a more dilute solution. The amount of chemical to use in this amount of solution will depend upon the weed problem, and will vary from three-quarters of a pound to three pounds of 2,4-D acid per acre.



(Above) Growth of semi-aquatic weeds along a ditch before application of 2,4-D. (Right) The effectiveness of proper application of 2,4-D may be seen in the dying and dead weeds.

Certain floating water weeds may be destroyed by a thorough spraying of the above-water portions of the plants.

Ordinarily the manufacturer's recommendations as to the amounts to use can be followed.

For controlling mustard and radish in grain fields about three-quarters of a pound of acid is required per acre and the cost for the chemical will be two to three dollars per acre.

For morning-glory control, where one and a half pounds per acre is the usual rate, the cost will be four to six dollars per acre. For some of the more resistant weeds, where three pounds may be required, the cost will be eight to twelve dollars per acre.

The cost of application usually is in the neighborhood of two dollars per acre.

Mode of Action

On most weeds the action of 2,4-D is much slower than that of other weed killers. Four to eight weeks may be required for the weeds to die down completely. In hot weather the effect is more rapid than in cool weather.

The first effect to be observed on sprayed plants is a twisting and bending of the stems and leaves. Some plants show a drying of the stem and leaves until the tops are completely dead. Others may remain green for several weeks, showing a swelling of the stems, with cracks or splits developing and callus tissue forming. Some of the woody plants change leaf color, becoming yellow or red as though it were autumn, before the leaves are dropped.

Seriously affected plants may have roots that are enlarged and spongy or are completely dead, several weeks after treatment.

Responses of Different Weeds

Of the perennial weeds tested, morning-glory (European bindweed) is apparently one of the easiest to kill. Hoary cress (white top) is somewhat more difficult but numerous kills of above 95 per cent with one spray have been obtained.

Several semi-aquatic weeds including cattail, tule, bur-reed, and kelp can be killed by proper applications of 2,4-D even when they are rooted below the water surface. The addition of three gallons of diesel oil per 100 gallons of spray is of some value in obtaining a kill of these species, possibly because of better penetration of the waxy cuticle of the weed. The ester preparations appear to be especially effective on these same species.

Floating water weeds such as water hyacinth, yellow water-weed, and **Hydrocotyle** were easily destroyed by a thorough spraying of the above-water portions of the plants.

Plants that form rosettes are particularly susceptible in that stage. Other plants should be young and growing vigorously with a well developed leaf surface. Old mature plants respond slowly, or not at all. All plants are more easily killed in the small seedling stages provided the application can be made at that time.

Effect on Grasses

Grasses, in general, are much more resistant to 2,4-D than are broad-leaved plants. This difference makes it possible to use the chemical for the eradiaction of such lawn weeds as dandelions and plantain. Bluegrass and ryegrass are more resistant than the bent grasses or red top. The spray will kill clovers and black medic as well as the weeds.

Turfs, grass pastures and grass seed fields may be treated using one and one-quarter pounds of 2,4-D acid per acre in 100 or 200 gallons of water but should not be sprayed when the grasses are blooming.

Cereal grains are also more resistant than many of the grain field weeds, and 2,4-D is being widely used as a selective spray in grain fields. The usual rate has been one-half to three-quarters of a pound of 2,4-D acid per acre. With a ground rig this amount of acid is applied in 100 to 125 gallons of water. Some injury to the grain has been noted when treatment was made on very young seedling grain but applications to grain that was four to six inches high have been without damage.

Apparently wild radish, star thistle, and mustard are readily killed by applications that ordinarily cause no damage to grain. Among the crops that have been successfully sprayed are oats, barley, and wheat. Milo and corn have been treated successfully using one to one and one-quarter pounds per acre.

Dusts containing 2,4-D will soon be available for treating grain fields. They must be used with care to prevent drift to other crops.

Applications by airplane of 15 gallons per acre of a solution containing about one and one-half pounds of 2,4-D were effective in controlling arrowhead lily, water plantain, some of the sedges, and other aquatic species infesting rice fields. Where the water was low at the time of spraying there was some damage to the rice but fields sprayed when the checks were full of water showed no injury.

Effect on Soil

Several instances of soil sterilization from the use of 2,4-D have been investigated. Broccoli, cabbage, sugar beets, tomatoes, beans and other crops have been damaged when put out in fields previously sprayed with 2,4-D. In several cases excessive amounts of the chemical had been used and in most cases the fields were dry from the time of application of the 2,4-D until immediately before planting the crop.

Tests indicate that the 2,4-D breaks down or leaches out of warm, moist soils within 30 to 60 days but may persist in cool, dry soils for six months or longer.

Flood irrigation following an application of 2,4-D would help to remove the residual chemical, particularly during the summer when the soil is warm. Winter rainfall is sufficient in many areas to remove the chemical and permit spring or summer seeding of most crops.

Precautions

In spite of the fact that 2,4-D has promise of being one of the most important chemicals in weed control, there are certain precautions in its use that should be observed.

1) Since the material is new and not thoroughly tested, it should be used with discretion and without the expectation of miracles from its use. The action is slow and a month or more may elapse before the tops are completely dead, and even a longer time before the roots disintegrate. In almost all cases, two sprays will be necessary to kill all the plants because some will be missed in the first spraying and new plants may come up from lateral roots not killed by the first spray. The sprayed area should be closely watched and any new growth or regrowth sprayed

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Economic Outlook For The California Dairy Industry

Extract from forthcoming Experiment Station Circular No. 366, "The Dairy Situation in California, 1947."

James M. Tinley

The immediate and long-time outlook for the California dairy industry, though fraught with some dangers and difficulties, is distinctly favorable.

Population and Buying Power

It is estimated that California's population will reach 10 million before 1950.

Some decline in buying power from the 1946 level is to be expected. This will tend to reduce the per capita consumption for some dairy products. The total volume of consumption of dairy products, however, will not be greatly reduced because of the growth of population. Even in 1945, all consumer needs for such products as market milk and market cream were not fully met because of shortage of supply.

Production

It is probable that milk production will continue to expand for several years but at a slower rate than the population growth. California's deficit position as regards milk production will thus become more pronounced.

Utilization

A growing proportion of all milk fat sold by farmers will be used in market milk, market cream, and ice cream. Although the volume of production of evaporated and condensed milk and of powdered whole milk will probably decline below the peaks reached during the war years, these products will utilize a substantially greater proportion of California's output of milk fat than before the war.

It is unlikely that butter and cheese together will utilize much more than 10 per cent of all milk fat produced annually. California will have to import a growing proportion of its consumption needs of butter and cheese.

Prices

Beginning in 1947, a decline in prices of milk and dairy products is to be expected. On the other hand, most costs are likely to remain fairly rigid.

Dairymen would be well advised to give greater attention to reduction of indebtedness and increase in efficiency of operation.

James M. Tinley is Professor of Agricultural Economics, Agricultural Economist in the Experiment Station, and Agricultural Economist on the Giannini Foundation.

Poisonous Plants on the Range Hold Important Place Among Causes of Stock Fatalities

George H. Hart

Minor losses of livestock are constantly occurring while grazing over the uncultivated lands comprising such a large part of the state total area. These losses are not serious in relation to the financial stability of any one outfit.

While the great infectious plagues were going their way such losses were not even given consideration. When the more serious death losses are brought under control the constant drain of these scattered fatalities are subjected to closer scrutiny. Thereby it soon becomes evident that they are due to a variety of causes in which toxic plants hold an important place.

There are hundreds of thousands of plant species. Animal and plant food relations are flexible depending on degree of stocking and variety of plants present.

Durango root (Datisca glomerata), a new toxic species demonstrated to be poisonous to cattle in Mariposa County in 1944. When dry forage is depleted, its green leaves and stems are attractive to the grazing animals.

Selective grazing is important and the existence of an ample supply of very palatable species may result in certain less palatable species not being grazed at all on some ranges. On others with less opportunity for selection they may constitute a considerable part of the total feed supply. Great grazing areas in different parts of the world may have entirely different flora constituting the plant cover.

Types of Toxicity

It has been facetiously remarked that any plant is poisonous to livestock provided they eat enough of it, if not by a true poison then by mechanical disturbances. It is of course recognized that all plants do not cause harm in the same way. Thus we have well known powerful plant poisons termed alkaloids from which drugs are made for use as medicines such as strychnine, morphine, atropine, cocaine, nicotine, and so forth.

In some plants the poisonous substances is all through the plant, but in many cases it is concentrated in very definite parts such as the root, leaf, flower, or seed. Thus it may only be present at certain stages of the plant's growth. The toxic substance may have a deleterious action in one species of animal and be not eaten or relatively harmless to another.

Quite a different form of poisoning is that produced by photosensitizing plants. In these species the plant develops a light sensitive substance which when ingested by the animal gets into the blood stream. No harm is even then caused unless the unpigmented white areas of the skin are exposed to sunlight. This results in the light sensitive substance reacting to the light and setting up great irritation or burning in the skin. This causes large areas of the skin to blister and peel off with great distress and loss of weight to the animal.

Klamath weed (Hypericum perforatum) is a plant causing this condition. It is grazed heavier by sheep than cattle and produces swelling of the ears, face and head of white faced sheep. The body is protected from the sun by wool but if closely clipped the body skin will manifest irritation. The Klamath weed has been extensively studied and the active principle in the plant causing the trouble was isolated by N. Pace at the University of California in 1939 and termed hypericin. Thus this plant widely scattered over the northern half of California is not only a noxious weed usurping the range from more desirable vegetation, but also acts as a toxic plant.

In the area of the Merced Irrigation District, photosensitization of cattle became serious some years back with hundreds of animals becoming affected every year. Careful study of the forage plants in the area has so far failed to show any of them to be the cause.

Treating the white parts of the hide of affected animals with machine oil containing lamp black, moving them from affected areas and better drainage, has greatly reduced the seriousness of the trouble. Recent work in Australia has shown that certain algae in standing water may cause the trouble.

Variations in Seasonal Incidence of Plant Poisoning

Stock with valley or foothill winter quarters may have been driven over a definite route to or from the mountains for years and suddenly losses will occur. Careful search may bring out the presence of a plant listed among the poisonous species. Further evidence will bring out the fact that only the root is poisonous, such being the case with water hemlock.

That particular year the soil was very moist when the animals were passing, resulting in pulling the plant from the soil, root and all, in the grazing process.

On the other hand only the flower or seed may be poisonous. The animal coming along at the same time in a very early season will find the plant further advanced and poisoning result. Thus larkspur is a real source of loss in early spring, particularly the first year following a burn.

When feed is very short and scarce, less palatable, and even poisonous, plants will be eaten that would have been left undisturbed under better feed conditions. Loco weed is somewhat in this class, but when animals get the habit of eating it they will search it out on account of having acquired a craving for the effect it seems to produce.

A cow in the area of the Merced Irrigation District affected with skin blisters on the muzzle and about the eye as a result of eating photosensitizing plants.

Thus natural conditions may be favorable for manifestation of trouble only once in three, five, or even ten years.

Constant Additions Being Made to the Poisonous Plant List

Investigations from time to time add new species to the poisonous plant group. A recent study by S. J. Van Der Walt and D. G. Steyn reported in the Onderstepoort Journal of Veterinary Science and Animal Husbandry, March 1946, is a case in point. They worked with eighteen plants from different areas in South Africa and four of them for the first time were proved to be toxic.

A similar finding resulted in July 1944 in Mariposa County, when D. Campbell of the Merced County Farm Advisor's office was called to investigate the cause of death of five head of cattle near Bridgeport with others showing severe diarrhea. Adjustments of fencing along a highway had enclosed two acres of additional land on which quantities of durango root (Datisca glomerata) were growing vigorously along a wet creek bottom.

None of this plant was present within the old fence line. Dry forage within the field was depleted and the green leaves and stems of durango root attracted the animals. This plant was not listed among toxic species. The evidence pointed so strongly to its being the cause of the trouble that investigations were made at the San Joaquin Experimental Range and the University Farm. This work showed the plant not to be very palatable for test cattle and sheep on good diets. This is quite typical and accounts for plant poisoning being more severe when feed shortage exists.

The data collected was published by K. A. Wagnon and G. H. Hart in the Journal of the American Veterinary Medical Association, July 1945. It showed the leaves, seed and seed capsules to be definitely toxic. Sublethal amounts in sheep and cattle cause diarrhea, loss of appetite and general depression.

It is doubtful if sheep would consume lethal amounts under natural range conditions. An intake of 250 to 275 grams resulted in death to a 750 pound twenty-one month old heifer and a 400 pound heifer calf.

George H. Hart is Professor of Animal Husbandry and Animal Husbandman in the Experiment Station, Davis.

Importance of Legumes in dry land rotation and their value in supplying nitrogen for the succeeding crop, is being studied.

Irrigated Pastures And Livestock Parasites

(Continued from page 1)

Lambs given daily doses of sulfaguanidine are protected from clinical symptoms. The high cost of sulfaguanidine, usually renders its use prohibitive as a preventive measure.

Stomach Worms. These worms (Ostertagia, large; Trichostrongylus, small; and Haemonchus contortus, twisted wire worm) invade the fourth stomach and small intestine of the animal. The eggs are excreted by the infected animal. They hatch, become infective, and crawl up the plants where they are eaten by the animals.

In acute cases, animals infected with stomach worms, scour, lose weight, and become weak and anemic. The diarrheic feces are typically blackish and of a particularly foul odor.

Prevention of stomach worm infections on irrigated pastures can be accomplished to a large extent by appropriate treatment of all new animals before they are placed on the pasture and, in heavily infected areas, by treating the animals every three weeks from the time they are three weeks old.

Nodular Worms. Symptoms similar to those of the stomach worm are produced by a group of parasites known as "nodular worms" (Oesophagostomum), which in acute cases may be more serious.

Generally these worms become a serious problem only in those regions where summer rains occur, but it is possible that moisture conditions in irrigated pastures may increase the problem in California.

Preventive measures against stomach worms are effective against nodular worms.

Liver Flukes. The liver fluke (Fasciola hepatica) inhabits the bile ducts of the liver. The adult flukes deposit tremendous numbers of eggs which are carried into the small intestine with the bile, and are voided with the feces of the infected animal.

At one stage of the life cycle of the parasites an appropriate species of water snail acts as an intermediate host. At a later stage of the development the parasites attach themselves as small white cysts on various meadow and swamp grasses and water plants, where they are eaten by the feeding animals.

Moderately infected sheep fail to gain weight properly, are poor mothers, and are easy prey to certain diseases. In very acute infections which are rare in sheep, the animal dies suddenly with bleeding from the nostrils and anus, suggesting anthrax.

Liver flukes in sheep are involved in the occurrence of the serious bacterial infection, Black Disease.

The clinical picture of liver fluke infection in cattle is somewhat different from that in sheep. Constipation is marked and the feces are hard and brittle. Diarrhea occurs only in the extreme stages. Emanciation occurs rapidly and the animals, especially calves, are soon prostrated.

Heavier infections are necessary to produce clinical symptoms in cattle than in sheep. Many times cattle are infected heavily enough for their livers to be condemned in the slaughter house but not sufficiently heavy to produce obvious symptoms.

Liver fluke infections in sheep and cattle may be treated successfully.

Effective snail control is the only practical means of controlling liver fluke infections in irrigated pastures.

Several surveys have been made to determine whether or not liver fluke infections were being acquired on irrigated pastures in California, and in no instance has such been found to be true. These investigations have shown that when cases of fluke infections were present in animals on irrigated pastures they were actually acquired elsewhere.

It has been said that liver fluke infections have been acquired on irrigated pastures in Mendocino County. It is true that appropriate intermediate snail hosts may occur on such pastures and it is possible that liver fluke infections may result.

The chief danger lies in the possibility that a snail-host population may build up in the irrigation ditches and that the immature flukes, leaving the snails, may be transported to the pasture plants during irrigation.

M. A. Stewart, is Associate Professor of Parasitology and Associate Entomologist in the Experiment Station.

Nutritional Deficiencies in Dams Found to be Cause of Deformities of "Acorn Calves"

"Acorn calves" are more common in the oak belt of the Sierra Nevada foothills than elsewhere.

They may be expected in dry years when animals are confined on poor feed in the same areas throughqut the year and spend a long time on dry feed. Deformity is more common in calves from heifers in their first pregnancy, but may occur in offspring of cows of any age.

An "Acorn Calf" with the characteristic short legs and the arched back, resulting from multiple nutritional deficiencies in the dam.

Deformities of "Acorn Calves"

Various types of deformity are found in acorn calves. The head may be short, often with undershot jaw, or it may be long and narrow. Usually the long bones of the fore- and hind legs are noticeably short. Other abnormalities include incoordination, inability to stand alone, arched back, and a tendency to chronic bloat. This last difficulty is often fatal in animals past the milk-drinking period.

Much rarer abnormalities are spasticity in one or more groups of muscles, wry neck, turning in circles, falling over backward, and goose-stepping.

Acorn calves somewhat resemble "bulldog calves," found in Dexter cattle. Bulldog calves are always born dead and usually prematurely. The deformities are much more extensive than in acorn calves, which are most often born at term and alive.

Acorn calves usually will live if helped to nurse during the first week. With good care they often reach adult life. Though not economically profitable, they can carry through their normal functions, including reproduction.

Vitamin Deficiency Suspected

The bulldog calf condition is hereditary; the acorn calf condition is not.

Acorn calves are so called because of a rather general impression that they result from the dams eating too many acorns during gestation. This is not true, but if acorns are the main ingredient of the diet they may prevent the formation or utilization of some essential food element and thus aid in producing acorn calves.

Experiments prove that the condition is due to maternal nutritional deficiencies, probably occurring between the third and sixth month of gestation. Once the alterations in the development of the fetus have taken place, they are not changed by good feed conditions during later months of pregnancy.

The specific deficiencies involved have not been found. They are multiple border-land deficiencies, and probably include lack of vitamins A, B complex, and D, as well as protein.

Suggested Means of Control

A consistent, constructive policy of livestock management, with supplemental feeding of cottonseed cake or leafy green alfalfa hay practically will eliminate the occurrence of "acorn calves." Such supplemental feeding will enable breeding cows to produce maximum percentage calf crops and calves of optimum weaning weight.

Growers are referred to pages 92 to 97 inclusive in the California Agricultural Extension Circular, No. 131, "California Beef Production." The circular is available without cost from the Farm Advisor of your county or by addressing the University of California College of Agriculture, Berkeley 4, California.

The Department of Forestry is making case studies of privately owned pine, Douglas fir, and redwood forests, with particular reference to the possibilities of sustained yield management by private owners.

The values of some natural feedstuffs with respect to growth, reproduction, and viability of chickens are under study.

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