

a golfer on the lesson tee, or playing, or in the locker-room, there is a chance to help that golfer with something there is in the shop.

Tommy Armour said in his best-selling golf book that proper equipment is the only part of a good golf game the player can buy. The pro has that improvement of a golf game to sell but he can't depend entirely on the needy golfers coming into his shop eager to buy.

He's got to do a lot of thoughtful and helpful missionary work outside the shop.

My old friend the salesman summed it up correctly when he said "The pro shop is everywhere the wise pro is."

How Research Led to Weed Control with CRAG 1

By A. J. VILTO

THE best known of our weed killers, 2,4-D (2,4-dichlorophenoxyacetic acid), was first described in 1942 by Drs. Zimmerman and Hitchcock of the Boyce Thompson Institute. 2,4-D, it is of interest to note, was not originally described as a herbicide but rather as a chemical which would alter plant growth and development. Later it was found that 2,4-D could be used to control broadleaved weeds in grass crops.

Since 1942 there has been a phenomenal increase in the amount of 2,4-D used in agriculture — an estimated 28 million pounds are used in the United States alone.

The eager acceptance of chemicals to control weeds and other pests has led to intensive programs involving the services of plant pathologists, physiologists and entomologists working in conjunction with chemists to discover new chemicals with broad pesticidal activity. This paper will trace the history and development of a new herbicide which has resulted from the combined efforts of scientists and others interested in agriculture and turf.

About six years ago a compound was submitted to the Carbide and Carbon Chemicals Co. fellowship biological research group at the Boyce Thompson Institute for preliminary evaluation as a pesticide. In initial screening tests the chemical was found to be ineffective as a fungicide or bactericide and was found to have no activity against insects. When it was sprayed on the foliage of plants it was also found to be ineffective as a herbicide.

However it was observed by Dr. L. J. King, who was conducting the herbicidal evaluations, that if seed were in contact with soil and the chemical added to this soil that the germinating seeds were rapidly destroyed. However if soil was not present and the chemical was applied directly to the seed, the seed germinated normally and produced normal seedlings and plants. In other words, here was a chemical that had no effect on fungi, bacteria, insects, or plant foliage but was active in inhibiting the growth of germinating seed only if soil were present.

Of what practical value is a chemical possessing these characteristics?

One of the major disadvantages of hormonal type herbicides such as 2,4-D is the hazard of drift especially where the chemical is applied close to susceptible crops such as cotton. But here was a compound which had no effect on foliage of plants. Thus the drift hazard encountered with 2,4-D could be eliminated.

Incidentally, by this time our compound was called Experimental Herbicide 1.

The chemical was found to destroy any germinating seed when in contact with soil and was found to have little or no adverse effect on established plants. Therefore it could be used to control germinating weed seed in many diverse crops such as corn, strawberries, asparagus, peanuts, in nursery stock and flower gardens. More recently it has been found to control germinating seed of crabgrass in established lawn and turf. The chemical is now marketed under the trade name CRAG Herbicide 1.

Crag Herbicide 1 possesses the following unique features which make it ideal for use in turf:

1. It destroys germinating crabgrass seed when applied at the rate of 6 lbs./A. (or 2.2 oz./1000 sq. ft.) in 100-200 gals. water beginning applications anywhere from April 1 to May 15 depending upon the local date of crabgrass germination. Control of weeds is effective for 3 to 4 weeks, therefore one application each month throughout the summer gives excellent control of all germinating weeds.

2. Crag Herbicide 1 is water soluble and is easily applied with conventional sprayers.

3. There is no ill effect on established turf since Crag Herbicide 1 is only toxic to germinating seed.

It should not be applied to newly seeded greens or turf, since it is toxic to all germinating seed.