Battery of fermentors (as seen from below) used in the manufacture of antibiotics.

Antibiotics Field Extended to Combat Plant Fungi

By THOMAS D. BROCK

When I tell people that I work with antibiotics, they generally ask this question: "Just what **is** an antibiotic? I know about penicillin—it's some kind of a mold, isn't it? But how were antibiotics discovered—how are they made?" So I start to tell them something about the antibiotics I'm associated with—the ones I see and work with every day. The story goes something like this.

The whole thing started back in 1929 when Sir Alexander Fleming discovered a mold which had the power to stop the growth of bacteria. Nothing much happened to this discovery for a number of years. Then, during World War II, with many men dying in the tropics because of bacterial infections, interest in this mold with strange powers renewed, and with the backing of the U. S. government penicillin was soon made available for our boys overseas, and later, for people on the home front. Today this strange chance discovery is a household word.

But what does penicillin have to do with golf? Nothing, directly. Although if it were not for penicillin, you might be home in bed with a sore throat, or worse, some sunny Sunday, instead of on the fairway.

After penicillin was developed, people began to ask: "Are there any other antibiotics?", and sure enough, after a long search, Dr. Waksman and his colleagues at Rutgers University discovered streptomycin, produced by another mold, which does wonders for people with tuberculosis. One by one, other antibiotics were discovered which cured other diseases of humans.

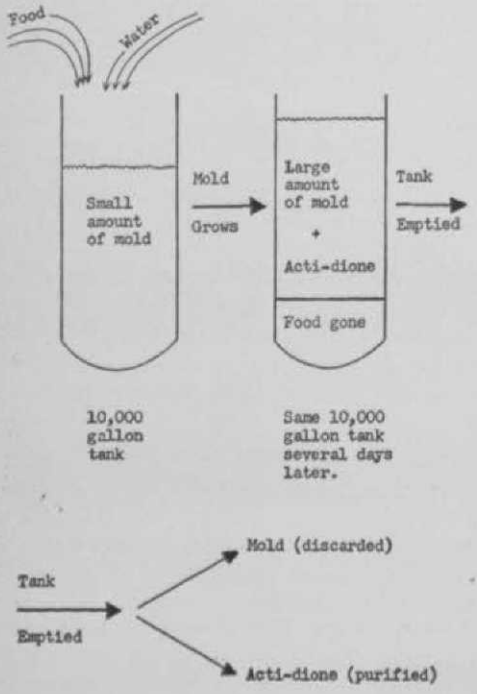
Seek Plant Disease Cure

Soon plant pathologists were asking: "Are there any antibiotics which will cure plant diseases?" The majority of serious human diseases are caused by bacteria. In plants, the situation is different. Most plant diseases are caused by fungi. With this knowledge, the search was on. In Kalamazoo, Michigan, people at The Upjohn Co. began looking for such an antibiotic which would kill fungi. The Upjohn Co. already had quite a lot of experience in antibiotics, having helped to develop penicillin for the U. S. government and, after the war, making penicillin, streptomycin, and other antibiotics for civilian use. After considerable investigation, an Upjohn research team came up with an antibiotic that had little effect on bacteria, but was extremely effective against many fungi. Because of the uniqueness of such a discovery, much research was put on this new antibiotic, which was named cycloheximide.

Acti-dione, registered trademark of The Upjohn Co. for its brand of this antibiotic, proved to be an entirely new type of substance, one that fungicide chemists had never considered before! This discovery was hailed widely in magazines and newspapers.

Research workers at Michigan State College at East Lansing took an interest in Acti-dione and tested it widely against many plant diseases. It proved to be very effective against a large number of diseases of turf, such as dollar spot, brown patch, snow mold, and melting-out (helminthosporium). It was found that

Fig. 1



one-third ounce of this potent substance would control melting-out on 15,000 sq. ft. of turf. It was found that if Acti-dione is mixed with iron sulfate, its potency is increased even more, and this combination even makes the grass greener!

Acti-dione, like many other antibiotics, is produced by a mold and here, in brief, are the steps used in its production:

First, the mold has to be grown. This is done in large steel tanks called fermentors, which hold about 10,000 gal. of water. Into this water is placed the food that the mold needs to grow. Then the whole tank, food, water and all, are sterilized by running high-pressure steam through coils around the fermentors. This sterilization is necessary to destroy any undesirable mold which might be present or get into the fermentor and spoil the process. After these preliminaries, a small amount of the mold, producing Acti-dione is placed in the fermentor. As time goes by, the mold grows. And, as it grows, it has the unique power to change some of the sugar and other food in the tank into Acti-dione. After a suitable number of days, the whole process is stopped, and the Acti-dione is removed from the water by chemical means. This whole process is illustrated in the figure.

Acti-dione may serve as an example of how all antibiotics are produced, since the process is essentially the same for any of them.

The question may be asked: "If these antibiotics are so unique, are they very difficult to find?" The answer is yes. Thousands and thousands of molds are examined to find one good antibiotic. The chances of finding a good one are extremely small.

Mesa CC Finances Tree Program

Mesa (Ariz.) CC members are contributing $10 each, plus labor and equipment, for the transplanting of 100 full grown palm trees onto the course layout.

The club is only three years old and it has too few trees to suit the membership. So it was that when member Leonard Sale volunteered to donate 100 palm trees from one of his properties, his offer was taken up eagerly.

But the lowest estimates on the cost of digging up the trees, transporting them to the course, and replanting them, were well over $1000. Pro Pete Wansa came up with the answer — a drive for member contributions.

Several members volunteered trucks and other equipment, and offered to assist in the work. Those offers cut the cost to about $10 per tree, and members were asked to give enough for one or more trees, which would then be known as "theirs."

All 100 of the trees are expected to be transplanted by the start of the summer season. And each will be labeled with the name of the donor.

As an added touch, the club will allow donors to move their erring balls from behind their own trees for a period of one year after the trees are planted.