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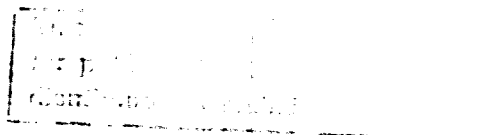
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Mechanisation Development of Chemical Weed Control

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It has long been known in agricultural practice that spraying or dusting different kinds of plants with some chemical materials produces their destruction. In the middle of the last century, in Russia, references begin to appear on the use of chemicals for destruction of weeds in crops. (Saakyan, N. M. 1841, Demidenko, T. T. and Borinova, R. A. - 1855). In 1855 it was already established that a small quantity of $ZnSO_4$ was sufficient to kill many kinds of monocots and dicots without harming the seedlings of coniferous plants (Dekotov, N. E.).

In Czarist Russia chemical weeding did not find wide acceptance. There was no production of herbicides. Various "patented" methods were imported which were advertised under great titles "powders from weeds" or "death to field radish", or "death to weeds," etc. Often they gave negative results and sometimes led to destruction of the crops; however, there were also successful tests, e.g., calcium cyanamide, which was distributed by a fertilizer drill, or seeder. After the passing of such a seeder the crop was worked criss cross with a harrow. The herbicide was thus mixed with the soil, for the equal distribution of the chemical substance along the surface being worked. An accessory was added to the fertilizer-seeder, consisting of a fan operated by the moving wheels of the machine. Such a seeder, "The Radikal", was used as a duster and for combating fungus diseases and injurious insects.

It was established that the herbicide kainite was better distributed and more effective when the powdery particles on the surface of the weeds was diluted by falling droplets of dew.

So as not to rely on the weather, an accessory called the "Vavara sikkolo" was added to the fertilizer-seeder. With its help, the weeds to be treated were moistened. In the forward portion of the seeder were mounted a reservoir for H_2O and a pump which was driven by the turning wheel. The kainite or the calcium cyanamide was sprayed directly behind this. The very finely powdered chemical having attached to the damp weeds formed a concentrated solution on the leaf surface.

But the powdered form of herbicides was rarely used due to the great material waste. The use of the liquid H_2SO_4 was limited by absence of an acid-proof apparatus. There were models of such sprinklers in foreign countries, but wide acceptance was not achieved due to inadequacies in construction. Beginning from 1900, in all countries, a search was being conducted for more effective and cheaper herbicides and methods of mechanizing their application. For this purpose, sprinklers were used which were imported from France and Germany, knapsack, one-horse and two-horse types. They were intended for the control of the beet beetle and were also recommended for chemical weeding of crops.

Constructional improvements in these machines were made locally, e.g., the native model, a modification of the Karl Platz factory sprinkler model 1909, was produced by the Martinskiy sugar-factory's workshop. In 1914, when, due to the beginning of the war, the delivery of sprinklers

to Russia was halted, the Petukhovskiy shops of the Pervoochenokskoe administration began to produce them, copying the model of the Golder machine. As K. V. Flerov and M. V. Blech note, by 1929 chemical methods of weed eradication received wide acceptance on the railroads. The weeds interfered with the movement of trains, causing wheel slippage, contributing to decay of the ties and interfering with the work being conducted on road-bed maintenance. For their control a special "watering-train" came into use. In front of the locomotive tender, at a height of 40 centimeters from the rails, were attached a 2-inch pipe up to 3.5 meters long. Along it in three rows were drilled holes through which flowed the herbicide.

For an increase of the width of the working radius, the ends of the pipes were curved and twice as many holes were drilled in them. Such a locomotive-sprinkler moved along the right-of-way at a speed of three kilometers an hour and treated the weeds with a solution of sodium acid sulfate. Although this method gave good results, it was not widely used in view of the strong corrosion of the locomotive tender and the apparatus by the acid.

A horse sprinkler of the Danish firm "Kaitof" was used for 30 years for the destruction of weeds in agricultural^{al} crops. It sprayed a liquid by means of a fast-rotating disc. There was a native aggregate constructed of the same type under the name of "Kombinat Zera", combining both a spr nkler and duster. Mechanization for the chemical control of weeds in the Soviet Union began to be

widely introduced but recently, especially intensively after the discovery of the group of compounds DNOK, 2, 4-D and 2N-4X, possessing a large physiological activity, solubility in H₂O and selectivity.

The demand for high-production sprayers led to the use of the airplanes Po-2, An-2, Yak-12. A special machine, the ZAN-2, was built for loading them with the toxic chemicals. Aerial spraying makes it possible to conduct weed controlling on large areas of grain crops in a short time, with minimum expenditures of labor and materials. It is expedient to use on-the-ground sprayers for small plots on very broken terrain, for fields which are surrounded by protecting timber strips and also for crops that are sensitive to the effect of the herbicides of the 2,4-D type.

In 1954 the All-Union Scientific Research Institute for the Building of Agricultural Machinery (VISHOM) developed the construction for the trailer-type field sprayer, OFP (with a 15 m. pipe), which was recommended for series production by the Povolzhskaya and Central-Chernozem MIS; however, the Administration for New Technics of the Ministry of Agriculture, USSR has not yet decided the questions of producing this necessary agricultural machine, that is suitable for the chemical control of weeds and harmful field cultures as well as in gardens. Various innovations for weed control with herbicides by the ground system have also been developed on the spot. For instance, in Chernigovskiy Oblast a gasoline truck was adapted for this purpose, and in the Krasnodar region a device was constructed which permits the

spraying of weeds in the rows with herbicides simultaneously with the between-row cultivation. At the present time government tests are being conducted on a sprinkler on the self-propelled chassis of the DSSh-14, and a model on the USSh chassis has been produced. The production of these machines will eliminate the deficit of field sprayers and will permit the successful conduct of chemical weeding.

The expediency of combining the sprayer with a cultivator was determined in tests made by the Leningrad branch of the All-Union Institute of Mechanization and VASKhNIL. In the current year, the factory "L'vovsel'mash" produced 10 models adapted to the cultivator KVM-2.8 for spraying growths in the rows with a herbicidal solution simultaneously with the cultivation between the rows by the shovels of the cultivator.

The procedure and means of chemical weed control has passed through a long stage of development. Now, there can be no doubt as to the necessity of a widespread introduction of chemically purging fields of weed growths.

It is important that, as quickly as possible, our agriculture be equipped with powerful field sprayers, suitable for chemical weeding of vegetable and technical crops as well as for grain crops, and also that it make the widest use of the procedures that it already has.

ILLUSTRATIONS

- #1 Treating a weeded plot with a herbicide (prior to the revolution).
- #2 A sprayer on the self-propelled chassis DSSh-16, constructions by VISKhOM, at work.
- #3 An experimental sprayer, the OBS-12, constructed in VISKhOM.
- #4 A sprayer for control of weed growths used on the collective farms of Chernigovskaya Oblast. Mounted on a gasoline truck.