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Pest Control Machinery in Japan

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General description

The pest control machinery in Japan have been mostly hand applicators which are small and light and used for a small area. As the agricultural modernization proceeds, however, hand applicators have been gradually replaced by high efficiency machines because the former are considerably lower than the latter in efficiency relating to working area per day or number of working hours per unit area. Unlike those in the Western countries, the machinery in Japan are small in size and weight, and particularly suited for lowland rice fields and sloping upland fields.

Trailer type power sprayer

The sprayer of this type consists of liquid tank, a reciprocating pump, an engine, hoses and nozzles. The hose is extended from the sprayer on a farm road and an operator

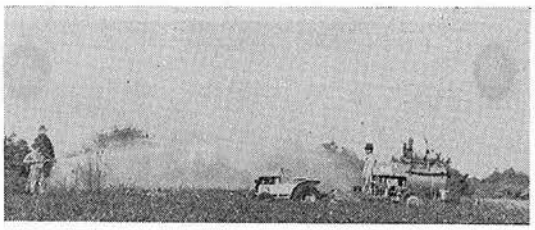

Fig. 1 Travelling type power sprayer

with the nozzle in his hand sprays a liquid chemical, moving along the ridge in a field. The merit of this machine is that the operator staying outside a lowland field can carry out the chemical application works very easily without using much of his physical power and saves much labor. As a result of tests performed in an agricultural experiment station, when a trailer type power sprayer applied 210 galons of parathion 0.047 per acre with swath width of 66 ft to rice stem borer, the control effect was about 85 percent.

The sprayer requires 3—5 workers for its operation who can perform the application of chemicals for 1 acre in about 10 to 20 minutes without supplementing chemicals and moving the machine around. The unit area of lowland fields for which the sprayer can work most efficienctly is considered to be 100×330 ft. In order to make deposit of chemical uniform, the travelling speed of the nozzle should be constant as shown in the following well-known equation. If application rate per acre=Q gal; swath width =L ft; nozzle discharge=q gal/min; and V=travelling speed,

$$V = 7.26 \times 10^2 \frac{q}{LQ} \text{ ft/sec} \quad \text{or}$$

$$V = 4.95 \times 10^2 \frac{q}{LQ} \text{ MPH}$$

When a travelling type power sprayer is employed against a disease, the application rate is higher than when it is used against an insect. The rate is reported to be 100—200 gal/acre against rice blast.

Travelling type power duster

The appearance of this type of power duster is just as shown in Fig. 2 and typical

of types used for lowland rice fields in Japan.

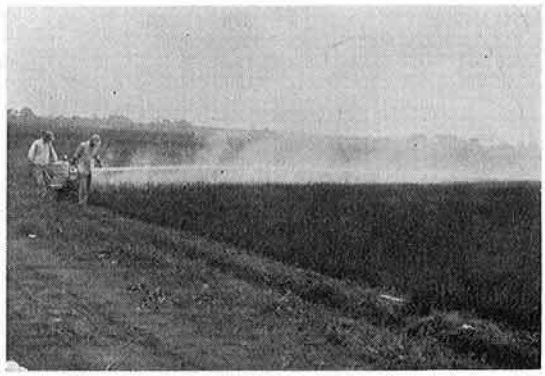

Fig. 2 Travelling type power duster

This machine moves along a farm road around a lowland field; the operator on the road holding the end of the boom type blow head 66—330 ft long dusts over rice plants from top to bottom. The machine has a large swath width and the number of workers employed for its operation is small. In the case that 3 percent of smithion was applied at the rate of 27 lbs/acre against the stem borer, the control effect was 80—85 percent. The time(t) required for application per acre can be calculated as follows:

If application rate=Q lbs/acre; and dischrge of blow head=q lbs/min;

$$t=Q/q.$$

If q=10, L=100 ft. and Q=27, travelling speed is V=1.8 mph. Uniformity of deposit of dust applied to lowland field indicated by coefficient of variation is 40—60 percent or 2 or 3 times the percentage available from a boom sprayer which is said to achieve the highest uniformity of deposit. The application rate is more than 27 lbs/sec and in a wind with a velocity of less than 3 ft/sec, the machine can achieve almost full control effect, in whole width. Therefore it can be employed efficiently for 4—6 hours per day (early in the morning and evening) in Japan.

If this pest control machine is operated for chemical application for about 40 percent of its total working time of 4 hours a day and 2 days are allowed for if to work with most effective results, its coverage of dusting will be about 70 acres in case that Q=27 lbs/acre and q=10 lbs/min.

Speed sprayer

Most of the orchards in Japan had employed stationary type power sprayers to control pests. It is not necessary to move the liquid tank when this power sprayer is used. Besides it can spray a large area at the same time. But if the area is more than 25 acres, it requires more than 20 workers, diminishing its labor saving efficiency. When a speed sprayer is used, its pump and tank have to be drawn by or mounted on a tractor. It sprays chemicals over fruit trees by air blown from an axial blower. It can work while running throughout the orchard and with the attendance of only one worker. Therefore, its labor saving efficiency is very high.

According to the test results of 11 speed sprayers which are now on sale in the market for the use apple orchards, the numbe of leaves with chemical deposit effctive to pest control occupied 60—85 percent of the total. For some sprayers with blower of a larger capacity and better designed blow head, the above rate increased to 78—94 percent.

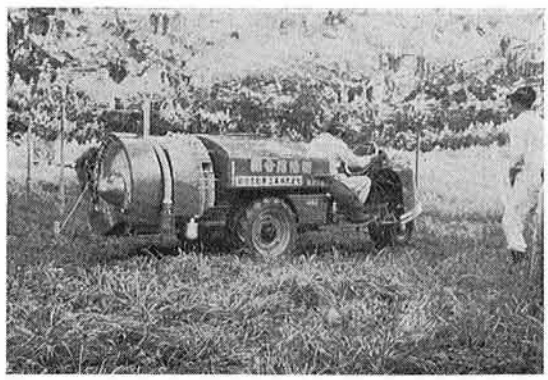

Fig. 3 Self-propelled type speed sprayer

The self-propelled type speed sprayer as illustrated in Fig. 3 was developed in Japan. This sprayer consists of a tractor and a speed sprayer in a single unit. It can make

a short turn easily and its maximum climbing angle is larger than other sprayers'. In a test, for instance, it could continuously work for about an hour on a slope at an angle of 210. But the trailer type speed sprayer's maximum climbing angle is only 80 to 120. As most of Satsuma mandarin orchards in Japan are located on slopes facing south and at an angle of more than 300, the self-propelled type speed sprayers can hardly be employed.

Granule applicator

Most agricultural chemicals had been either liquid or dust until 1958 when a study on granular herbicide was started and in 1960 hand granule applicator was developed. Granular chemicals, especially granular herbicides are characterized by that they are not deposited on plants' leaves but drop all on the ground and that they are not blown off by wind over to other crops unlike herbicide chemicals. Therefore they do not give harm to other crops. Besides they easily are handled.

The smaller the diameter of the granules the better uniformity of deposit is attained although they are more easily carried away by wind. When the diameter was larger, the discharge rate of the granules could hardly be adjusted due to the mechanical structure of the applicator. But granules now in use are with the diameter of 1/64—3/64 inches and give no trouble for smoth function of applicator. Their moisture content is 10 percent. It is essential for them to have a low hygroscopicity.

The hand granule applicator is used for hand duster, too, as illustrated in Fig. 4. To use the duster as applicator, agitator at the bottom of dust tank is removed and a special hollow plate is set instead. Thus the applicator can scatter evenly granular herbicide such as PCP, NIP, 24-D, MCP, etc. Its application rate is 28 lbs/acre and the time required for application is about 1 hr/acre.

The tractor mounted type granule applicator has been developed from broad caster which applies much fertilizer such as lime and granular fertilizer at a time, by

Fig. 4 Hand granule applicator

improving the feeding and adjusting mechanism. It can apply a small amount of granular chemical uniformly. The Usefulness of this applicator has been proved by many agricultural experiment stations in various prefectures.

Helicopter application kit

Aerial application of chemical in America is mostly carried out by airplane while that in Japan mostly by helicopter. In Japan it is because that no airport for airplane's landing and take off is available near farm and that farm area for which aerial application is performed is too small. But a helicoptor can land or take off at will on a farm road and if it flies at an altitude of less than 25 feet, chemical can be blown in to the roots of crop plants by down oscillation generated by rotation of the rotor. On the other hand, however, as the helicoptor has a chemical carrying capacity much smaller than that of

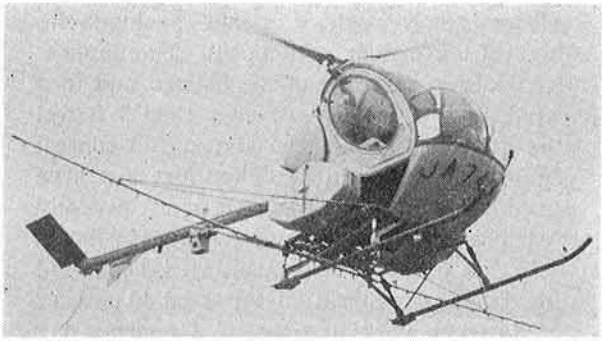

Fig. 5 Liquid application Kit of Helicopter

airplane, it has to land and take of more frequently for supplementing chemical. Besides, the price of a helicoptor is somewhat higher than that of an airplane.

An attachment to applicator is a kit for dust, spray, or granule. An extremely concentrated spraying has recently been studied. This is to achieve an adequate control effect with the application rate of 0.1 gal/acre. There are suggested two types of sprayer: spin nozzle type and compressed air type. Both types are now manufactured for trial. If they are used in the field, a heilcoptor equipped with this sprayer will be so efficient as to take only about 30 minutes to apply chemical to about 150 acres in one flight.

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Early Weaning of Young Animals with the Use of Synthetic Milk

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Due to improvement of synthetic milk and formulated feeds, pigs raised in Japan now are put on the market in about six months after birth, compared to eight or nine months in the past.

With the use of synthetic milk, it became possible to wean pigs shortly after farrowing and, as a result, to reduce the labor of sows in suckling to pigs. As the mother can be rebred more quickly after birth, it is possible to farrow two and a half times in 12 months.

The main purpose of this paper is to summarize the study in Japan on early weaning of pigs with synthetic milk.

This paper is also concerned with the study on calf starter.

I Synthetic Milk for Pigs

The study of synthetic milk in Japan was started in 1951. As synthetic milk is used as a substitute for sow's milk, the study on it was started from obtaining information on the constituents of sow's milk. As a result, the following information which could serve as guides to study of synthetic milk for early-weaned pigs were obtained.

Sow's milk contains high quality protein and much fat and lactose. It also contains calcium, phosphorus and other trace minerals. But sow's milk is low in iron and copper, so it has been said that pigs fed only sow's milk easily contract anemia. As vitamins, vitamin A, D and vitamin B-complex are contained in sow's milk.

The first synthetic milk prepared based on this information contained high quality protein, much fat, high quality carbohydrates as substitutes for lactose, vitamins and minerals. Together with these constituents antibiotics were added because it is known to promote fast growth and to prevent scouring.

There are two types of synthetic milk