AD 683059

TRANSLATION NO. 1541

DATE: 30 Sept 1965

DDC AVAILABILITY NOTICE

[redacted]

DEPARTMENT OF THE ARMY
Fort Detrick
Frederick, Maryland

13

1) In place of weeds (which despite additional sowing of them, as a rule, spread and develop very unevenly) there are sown plant-indicators closely similar in botanical indicators to weeds which spring up most frequently where things are planted.

2) Resort is had to early gathering of plants-indicators during the period when the herbicidal effect of the preparations being studied ceases to manifest itself and when crop plants develop to the point where weeds no longer suppress them.

3) There are introduced the so-called background herbicides for elimination of the effect of natural weeds which are characteristic of the given test area on the yield of plants-indicators.

4) The method involving momograms is used for obtaining the functional dependence between doses of herbicides and the yield. This makes it possible in establishing the herbicidal activity of preparations to compare doses which give the same effect (and not conversely) and to obtain numerical indicators which show by how much or by how many times one preparation is weaker or stronger than anoth- .

5) With the help of nomograms there is established an index of selectivity (according to Verter and Kholst) with the help of which this characteristic too of the preparations is described with greater accuracy and gets a numerical value.

By way of example of this method we will present a description of the results of a test conducted in 1964 on the Dolgoprudnaya Agricultural Test Station in a field evaluation of herbicidal preparations.

The test was conducted on six crops with ten preparations using one period of introduction (optimal for each preparation) in five logarithmically increasing doses. Plots measuring 100 meters were sown with six crops of which beets or carrots and peas -- the main test plants -- occupied 30 square meters each and mustard, oats, and millet -- plants-indicators -- occupied 12.5 square meters. The test was repeated twice.

The application in the test of five doses with two repetitions was based on special tests conducted in the course of the preceding two years in which there were compared the results obtained from introducing two doses in four repetitions, three doses in three repetitions, five doses in two repetitions, and nine doses without repetitions. These tests showed that the best results were obtained when five doses were tried in two repetitions. The locations of the points on the nomogram were such that a straight line on the nomogram could be drawn only in one direction and no other way and at the same time with nine doses without repetitions the distribution of points proved to be great and made difficult the selection of the correct direction when drawing a straight line. With three - and even more so with two - doses the number of points was inadequate and the straight line drawn could not be corrected with the inadequate number of points (see Figure 1).

During the tests the herbicides were introduced with a ORP-A knapsack sprayer. The logarithmic change (in this case a lowering) of doses was performed by the method of successive dilution of the initial batch by bringing in each instance the amount of fluid to 800 liters per hectare.

In Table 1 there is given brief information about the preparations used in the tests. [TN: The following words in Table 1 are transliterations:

Better Methods for Field Tests of Herbicides

#1541

Yu. Ya. Starosel'skiy, L. I. Korolev, and N. M. Bogdanov

Large foreign firms which produce chemical preparations for agriculture constantly check the properties of their herbicides in their own laboratories and test centers or through government scientific research institutes and agricultural experimental stations.

At the industrial crop station in Beltsville (state of Maryland, USA) the initial field evaluation of preparations is performed on many crop and weed plants. The methods of introducing the preparations, the dose, and the intervals of time between applications of the herbicides into the soil and the sowing of the plants vary. The herbicidal activity of preparations is evaluated by eye using a 10-point system and is expressed in half-points multiplied by ten and a percentage of the lowering of the growth of the plants. Thus, the herbicidal activity acquires a numerical value from 0 (lack of effect) to 100 (complete destruction).

The Laboratory of Herbicides and Defoliants of the NIUIF [Scientific Institute of Fertilizers and Insecto-Fungicides] in 1961 conducted such a test in a shortened form at the Dolgoprudnaya Agrochemical Test Station in which 19 preparations were tested on six crops using two periods of introduction and four logarithmically increasing doses. Along with measurement by eye of the condition of the plants and the measurements made of their growth, measurements of weight of plant yield were also performed during the tests.

The data obtained showed the prospects for conducting an initial evaluation of preparations and at the same time the inadequacy of giving only a point evaluation and a measurement of plant growth. The most reliable and objective indicator of herbicide effect was the yield, the need for calculation of which was established sufficiently convincingly.

Tests of the past few years have resulted in many changes and improvements in accuracy in the methods of conducting initial field tests. The most important changes have been the following:

 [redacted]

dalapon, alipur, murbetol, eptam, piramin, atraton, prometrin, propazin.]

Table 1

Name	Active substance	Recommended	
		in sowings of	for combatting
Dalapon	2,2-dichlorpropionate acid	beets	monocotyledonous weed grasses
Alipur	1-cyclooctyl-3,3-dimethyl-carbamide + butinyl-3-chlorophenylcarbamate	beets, peas	dicotyledonous weeds
Murbetol	Endotal + IFK	beets	grasses and dicotyledonous weeds, excluding goosefoot, pigweed, mustard, and bent grass
Eptam	Ethyl-di-norm-propylthyol-carbamate	beets, beans, potato	grasses and dicotyledonous weeds
Piramin	1-phenyl-5-chlorine-pyridazone-6	beets	dicotyledonous weeds
Trichloro-propionate	2,2,3 trichloropropionate acid	beets, cotton plant, flax	weed grasses
Trichlo-racetate of sodium	Trichloracetic acid	cotton plant, tobacco, vegetables, beans	weed grasses
Atraton	2-ethylamino-4,6-bis-isopropylamino-simm-triazine	beans	annual grasses and dicotyledonous weeds
Prometrin	2-methylthio-4,6-bis-isopropylamin-simm-triazine	carrots, onions, beans, potato	annual grasses, especially millet and dicotyledonous weeds
Propazin	2-chlor-4,6-bis-isopropyl-amino-simm-triazine	millet, corn, sorghum, carrots	annual grasses and dicotyledonous weeds

The most complete herbicidal activity of preparations and their selectivity are characterized by indicators of weight of the entire mass of the plants which forms by the time the plants are gathered. Therefore, omitting data on the thickness of stand, the height of growth of plants, and the nature of the damage caused by herbicides, we will examine those changes in the yields which were created as a result of the gradually increasing doses of the preparations which were used.

As already noted, plants-indicators were gathered in the test while they were young, that is, at the time the effect ceased to grow, which for all practical purposes coincided with the period when damage from weeds drops off considerably. Thus, mustard was gathered during the flowering phase, oats was gathered at the beginning of the heading process, and millet was gathered in the phase of formation of five -- eight leaves. Carrots and peas were also gathered somewhat earlier than the usual time partly to avoid possible spoilage. The beets were gathered at the end of the vegetative porcess.

The data obtained, expressed in percentages based on adjacent control plants, were entered on sime-logarithmic graph paper and the functional dependence between the height of yield and doses of herbicides portrayed graphically.

An examination of the monograms makes it possible to establish herbicidal activity of preparations as well as their selectivity.

Dalapon (Figure 2), within the limits of the doses studied, did not exhibit adequate herbicidal activity and did not result in 80% damage to even one of the plants being tested. Even a dose of six kilograms per hectare did only slight damage to grass, causing a lowering in the weight of the green mass by only 20 -- 30%. The damage to dicotyledonous plants was also inadequate.

Alipur (Figure 3) was distinguished by a high level of activity. In doses of 0.6 -- 0.75 kilograms per hectare it lowered greatly the weight of the green mass of mustard and docotyledonous weeds which in the test consisted of wild radish, spurry, buckwheat, pigweed, yellow sow thistle, and others. Alipur did not have any significant effect on the yield of the overall mass of grasses, peas, and beets. It showed high selectivity in sowings of beets and peas surrounded by dicotyledonous weeds and mustard. 80% damage to the latter was obtained with a dose of about 0.8 kilograms per hectare and a lowering in the yield of beets and peas up to a maximal dose (1.5 kilograms per hectare) was not observed and, consequently, could only be beyond its limits, that is, in doses greater than 1.5 kilograms per hectare. From this it follows that the index of selectivity will be $> 1.5:0.8 = > 1.8$ (relation between the dose causing an allowable 20% lowering of crop yield and the dose causing 80% damage to weeds; the higher the index is than unity, the better is the selectivity and conversely).

Murbetol was very active with respect to oat grasses and docotyledonous weeds (Figure 4) and damaged them almost completely with the use of the lowest dose tested -- or 7.5 kilograms per hectare. For the destruction of millet and mustard there is needed considerably larger doses of murbetol on the order of 15 -- 20 kilograms per hectare at which doses peas and beets began to suffer damage. Thus, it proved to be very selective in sowings of beets and peas which were surrounded by dicotyledonous weeds and oat grasses (since the corresponding indexes were greater than 2.4 and 2.2) and were inadequately selective when surrounded by mustard and millet.

Eptam (Figure 5), as did murbetol, demonstrated during the tests an adequately high degree of activity in the case of oats, damaging it with low doses (3 -- 4 kilograms per hectare). For damage to millet it was necessary to introduce eptam in a dose of 7 kilograms per hectare. Peas and beets were unharmed with only small doses of eptam and the yield was decreased noticeably when the doses were increased to higher than 7 kilograms per hectare. Eptam possessed good selectivity in sowings of peas surrounded by weed grasses (indexes 3.3 and 1.8) and an adequate selectivity for beets surrounded by oat grass weeds (2.9), but less selectivity when the weeds consisted of millet (1.5).

Piramin (Figure 6) was effective against mustard and docotyledonous weeds and caused their destruction with doses of up to 3 kilograms per hectare. Grasses were not destroyed by piramin. Peas and beets didn't suffer damage from piramin and withstood well the introduction of even 6 kilograms per hectare of this preparation. In sowings of these crops surrounded by mustard and dicotyledonous weeds piramin showed high selectivity (indexes greater than 2).

Trichlorpropionate (Figure 7) damaged oats when applied in doses of 10 kilograms per hectare. Mustard suffered from trichlorpropionate but were not destroyed to a sufficient degree with a dose of 20 kilograms per hectare. Peas suffered practically no lowering in yield from doses of trichlorpropionate which were used, and beets became suppressed in growth beginning with doses of 11 kilograms per hectare. It was highly selective for peas surrounded by oat grass weeds (>1.8) and usable for beets in the presence of the same weeds (1.0).

Trichloracetate of sodium (Figure 8) showed adequate effectiveness against grasses. Oats and millet were damaged by this preparation when introduced in a dose of 16 kilograms per hectare. With respect to dicotyledonous plants beets, peas, and mustard proved to be resistant to small doses of trichloracetate and were suppressed by high doses, lowering the yield slightly with the introduction of 16 kilograms per hectare and to a greater degree with further increases in the dose of this preparation. Trichloracetate of sodium showed good selectivity in sowings of peas and beets surrounded by weed grasses (indexes>1.5).

Atraton (Figure 9) showed relatively weak herbicidal activity which for other herbicides of the triazine group is usually high. In a dose of 3.75 kilograms per hectare it destroyed only mustard and it strongly suppressed beets. Grasses in test doses were destroyed poorly by atraton, and peas remained resistant and showed no decrease in yield. Atraton proved selective only in the case of sowings of peas surrounded by mustard (>1).

Prometrin (Figure 10) destroyed dicotyledonous weeds well. Doses of about 1.5 kilograms per hectare were adequate for almost complete destruction. Mustard was destroyed by prometrin to a somewhat lesser degree; the same effect was achieved on mustard with an application of 2.5 kilograms per hectare. Carrots were not suppressed at all by prometrin and the yield of carrots didn't decrease when the doses which caused destruction of dicotyledonous weeds and mustard were used. Prometrin didn't have any effect on grasses. Prometrin was characterized by high selectivity when carrots and peas were surrounded by dicotyledonous weeds and mustard (indexes>1.7 and >1).

Propazin (Figure 11) showed even greater activity. The lowest test dose -- 0.6 kilograms per hectare -- destroyed dicotyledonous weeds completely and one kilogram per hectare was enough to destroy mustard. Doses higher than 1.2 kilograms per hectare had an adverse effect on oats and somewhat suppressed the growth of carrots. Millet was resistant to propazin even with a dose of 1.75 kilograms per hectare. The undesirable effects of prometrin on peas was not noted. Selectivity of propazin in sowings of carrots and peas surrounded by dicotyledonous weeds and mustard was even higher than in the case of prometrin (indexes >2.9 and >1.9).

In Table 2 there is given the overall picture of selectivity for all of the test preparations.

Table 2

Indexes of Selectivity

Preparations	In Sowings of Beets Surrounded by		In Sowings of Peas Surrounded by		In Sowings of Carrots Surrounded by	
	Grasses	Dicotyledonous Weeds	Grasses	Dicotyledonous Weeds	Grasses	Dicotyledonous Weeds
Dalapon	-	-	-	-	-	-
Alipur	*	>2	*	>2	-	-
Murbetol	>2,4	>2,4	2,2	2,2	-	-
Eptam	2,2	*	2,5	*	-	-
Piramin	*	>2	*	>2	-	-
Trichlorpropionate	1	*	>1,8	*8	-	-
Trichloracetate	>1,5	*	>1,5	*	-	-
Atraton	*	*	*	>1	-	-
Prometrin	-	-	*	>1,3	*	>1,3
Propazin	-	-	*	>2,4	*	>2,4

* -- selectivity inadequate.

Thus, based on the results of the tests it is possible to reach the conclusion that of the tested preparations there can be applied (in kilograms per hectare):

1) in sowings of beets: alipur -- 0.8; murbetol -- 18; eptam -- 7; piramin -- [illegible]; trichlorpropionate -- 10; and trichloracetate -- up to 16.

2) in sowings of peas: the same preparations as for beets and also atraton -- 4; prometrin -- 2.5; and propazin -- 1.

3) in sowings of carrots: prometrin -- 2.5; and propazin -- 1.

In the indicated doses of eptam, trichlorpropionate, and trichloracetate of sodium there were destroyed only grasses; with doses of alipur, piramin, atraton, prometrin, and propazin -- only dicotyledonous weeds; and with doses of murbetol -- grasses and dicotyledonous plants.

An examination of the results described in this test shows that this method which has been worked out and applied in the NIUIF for conducting tests for the purpose of determining herbicidal activity and selectivity makes it possible to study new preparations with greater completeness and accuracy. The use of logarithmically increasing doses, the construction of nomograms, and the determining of the functional relationship of the doses of herbicides and yields makes it possible to use numerical expressions in evaluating herbicidal properties of preparations being studied which is extremely essential for giving a correct idea of their relative effect. This is especially valuable also in testing various types of one and the same herbicide when the differences in effectiveness are not great but can be established with sufficient accuracy so as to justify economically changes in the technological processes used to produce them.

Along with evaluation herbicidal preparations this method can be

 [redacted]

used with success in working with fertilizers, insecto-fungicides in studying agrotechnical methods (for example density of sowing), and others.

Using this method in the laboratory for testing herbicides and defoliants in the NIUIF in conducting field, vegetational, and even laboratory tests has proven to be completely sound.

Scientific Research Institute
for Fertilizers and Insecto-
Fungicides imeni Ya. V.
Samoylov

Submitted to the Editors
31 October 1964

9 doses without repetitions

1963 Test

1964 Test

Yield of Green Mass

5 doses in two repetitions

in four repetitions

3 doses in three repetitions

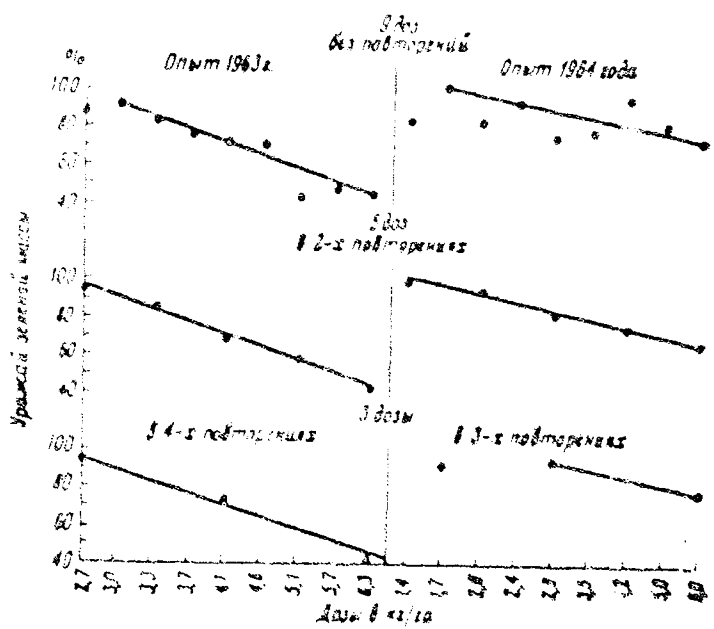
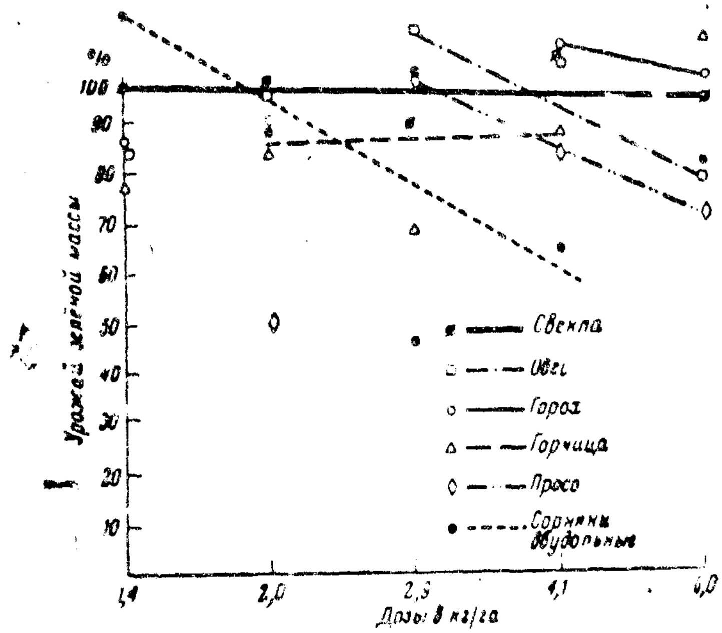


Рис. 1. Зависимость урожая овса от доз далапона

Doses in kilograms per hectare

Figure 1. Dependence of yield of oats on doses of dalapon.

Yield of Green Mass



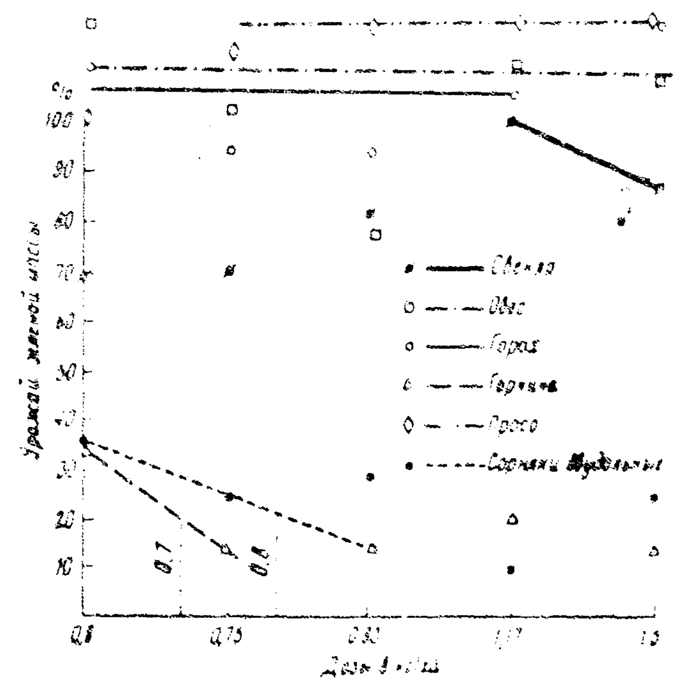
Beets
Oats
Peas
Mustard
Millet
Dicotyledonous Weeds

Рис 2. Номограмма действия далапона на урожай зеленой массы растений

Doses in kilograms per hectare

Figure 2. Nomogram of the effects of dalapon on the yield of green mass of plants.

Yield of Green Mass



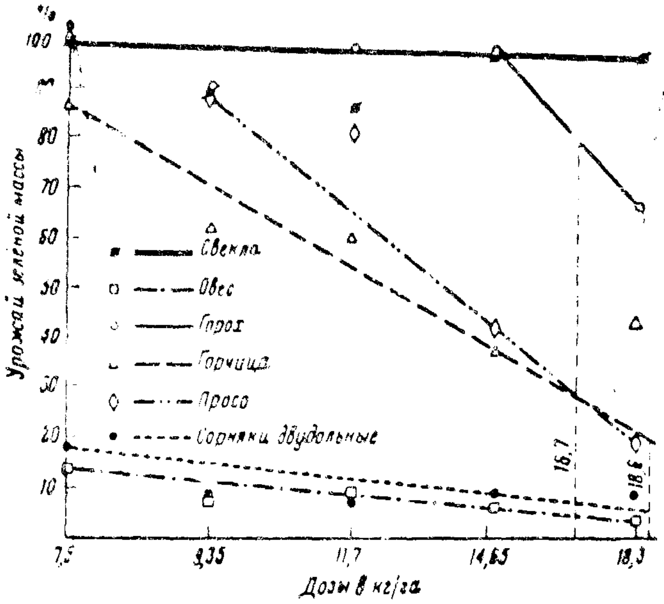
Beets
Oats
Peas
Mustard
Millet
Dicotyledonous Weeds

Рис. 3. Номограмма действия алипура на урожай зеленой массы растений

Doses in kilograms per hectare

Figure 3. Nomogram of the effects of alipur on the yield of green mass of plants.

Yield of Green Mass



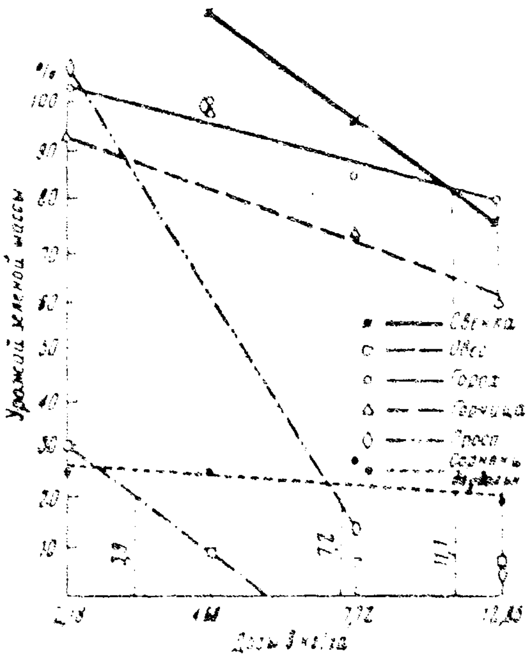
Beets ⌀ ═══
Oats □ — · —
Peas ○ — — —
Mustard △ —— ——
Millet ◇ —·· ——
Dicotyledonous Weeds • - - - -

Рис. 4 Номограмма действия мурбетола на урожай зеленой массы растений

Doses in kilograms per hectare

Figure 4. Nomogram of the effects of murbetol on the yield of green mass of plants.

Yield of Green Mass



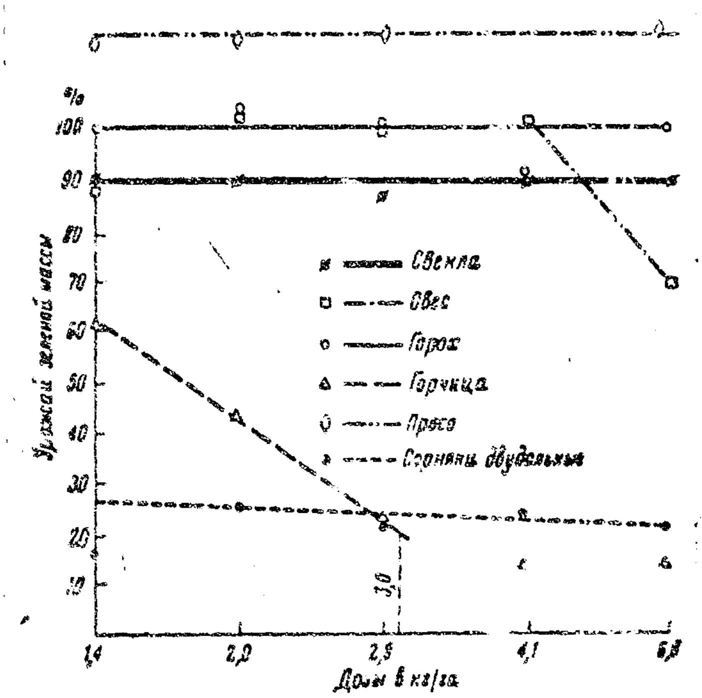
Beets ⌀ ═══
Oats □ — · ——
Peas ○ ———
Mustard △ —— ——
Millet ◇ —·· ——
Dicotyledonous Weeds • - - - -

Рис. 5 [illegible] действия [illegible] на урожай [illegible] массы растений

Doses in kilograms per hectare

Figure 5. Nomogram of the effects of eptam on the yield of green mass in plants.

Yield of Gr[illegible]n Mass



Beets — —
Oats — · —
Peas — —
Mustard — —
Millet — ·· —
Dicotyledonous Weeds — — —

Рис. 6. Номограмма действия пирамина на урожай зеленой массы растений

Doses in kilograms pe[illegible] hect[illegible]re

Figure 6. Nomogram of the effects of pi[illegible]amin on the yield of the green mass of plants.

Yiel[illegible] of Gre[illegible] Mass

Beet — —
Oats — · —
Peas — —
Mustard — —

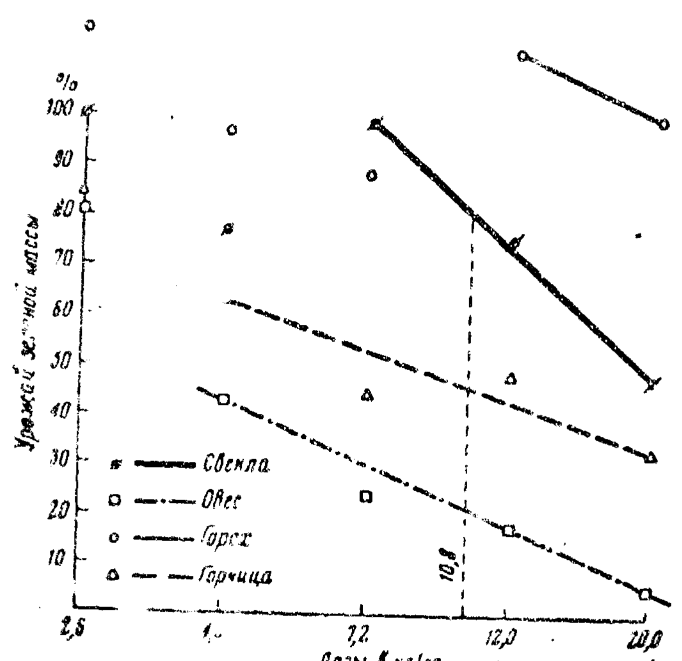


Рис. 7. [illegible]омограмма действия трихлорпропионата на урожай зеленой массы растений

Doses in k[illegible]lograms per hectare

Figure 7. Nomogram of the effects of trichlorpropionate on yield of green mas[illegible] [illegible]f plants.

 [redacted]

Yield of Green Mass

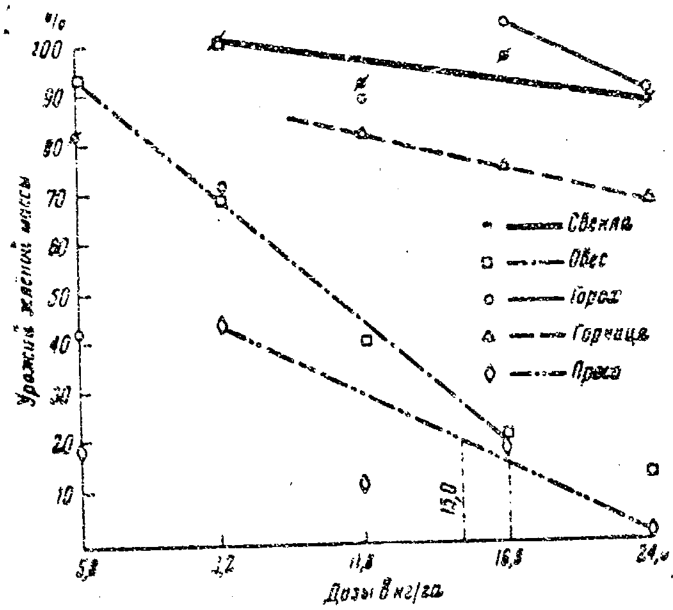


Рис. 8. Номограмма действия трихлорацетата на урожай зеленой массы растений

Beets ø; Oats □; Peas ○; Mustard △; Millet ◇

Doses in kilograms per hectare

Figure 8. Nomogram of the effects of trichloracetate on the yield of green mass of plants.

Yield of Green Mass

Beets ø; Oats □; Peas ○; Mustard △; Millet ◇

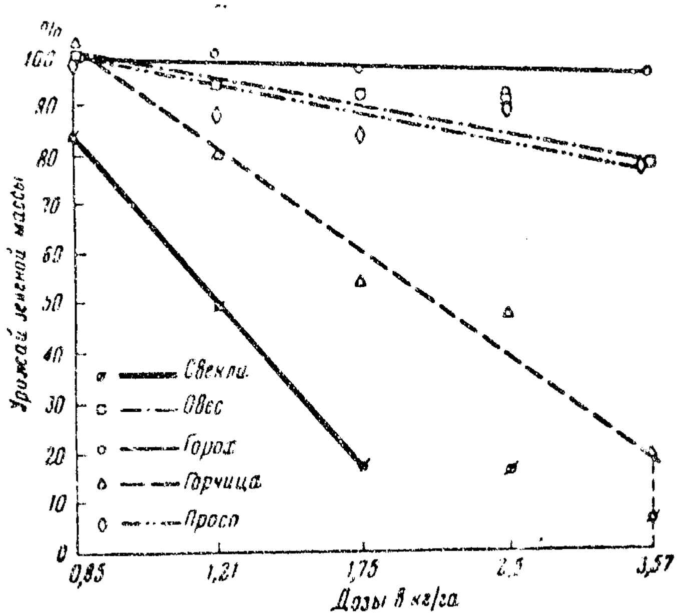


Рис. 9. Номограмма действия атратона на урожай зеленой массы растений

Doses in kilograms per hectare

Figure 9. Nomogram of the effects of atraton on the yield of green mass of plants.

Yield of Green Mass

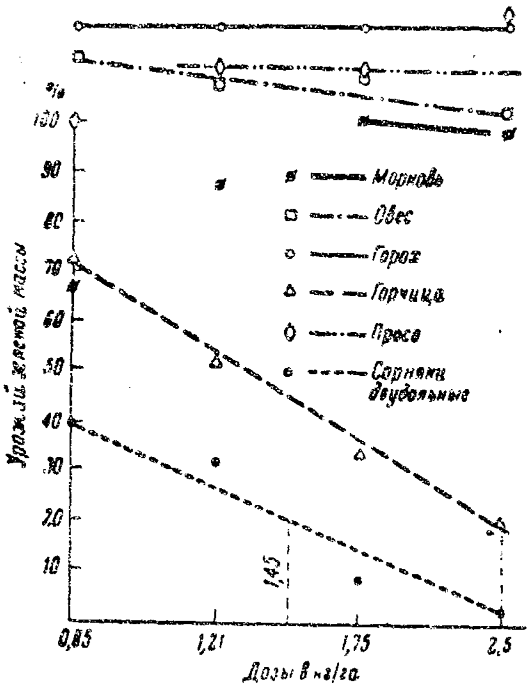


Рис. 10. Номограмма действия про...трина на урожай зеленой массы растений

Carrots ⌀
Oats □
Peas o
Mustard △
Millet ◇
Dicotyledonous Weeds

Doses in kilograms per hectare

Figure 10. Nomogram of the effects of prometrin on the yiel... green mass of plants.

Yield of Green Mass

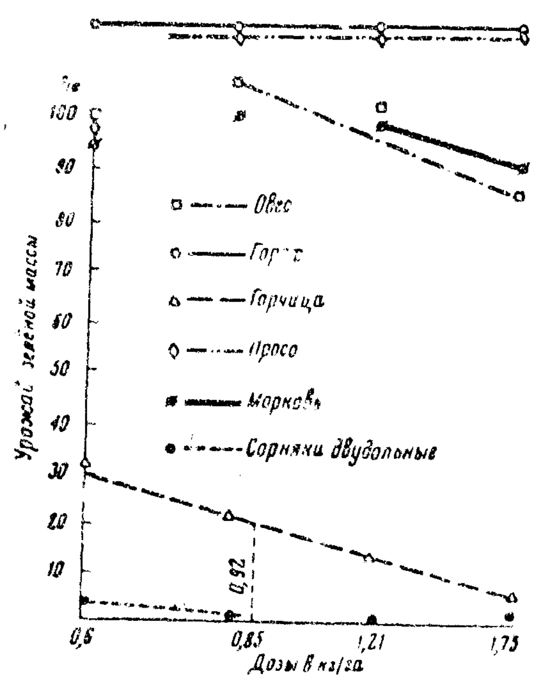


Рис. 11. Номограмма дейст... пропазина на урожай зеленой массы растений

Oats □
Peas o
Mustard △
Millet ◇
Carrots ⌀
Dicotyledonous Weeds

Doses in ki...ams per hectare

Figure 11. Nomogram of the effects of propazin on the yield of green mass of plants.