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SUNFLOWER'S DRY ROT AND METHODS TO REDUCE ITS HARMFUL IMPACT

In the central part of the Pre-Caucasus area dry rot of the heads is a very dangerous disease second in virulence only to downy mildew. It is considerably developed in two zones, (1) the steppe-wormwood-grain and (2) the motley grass-grain, which account for 73% of all sunflower areas in the central part of the Pre-Caucasus. The disease affects 43 to 62% of all crops, the average proportion of sick heads being 3.6-6% between 1959 and 1973, and in some years rising to 21-27%.

The heads' sickness is accompanied by the infection of seeds, a 46.8% drop of their yield per plant and a reduction of normal seeds by 38.2% and of the mass of 1,000 seeds. The seeds' sowing qualities deteriorate especially, viz. their germinative power and laboratory and field germination (Table 1).

When sunflower is affected by dry rot the soil quality worsens too (B.I. Rubin, Ye.B. Artsikhovskaya, 1968).

The disease is caused by two types of the fungus Rhizopus nadosus Namysl. and Rhyzopus nigricans Ehr. (M.A. Zeppe, 1937; I.G. Beilin and M.G. Lebedyansky, 1941; V.N. Yagodkina, 1963), developing in different ways in different agroclimatic zones.

We studied the pathogenicity of these species under artificial inoculation of the heads in different stages of development. Inoculation was affected by superficial incision and introducing the suspension of the fungi of the same age and with the same spore concentration (N.A. Naumov, 1937). The analysis of the data obtained makes it possible to conclude that pathogenic properties are more clearly expressed in the first species, especially in the sta-

Table 1

Dry Rot's Impact on the Quality of Sunflower Seeds (Smena variety) 1969-1973

Seeds	Mass of 1,000 seeds	Huskness, %	Oil content	Germinative power	Germination	
					laboratory	field
Healthy	73.6	23.1	46.2	93.7	98.6	92.8
Sick	44.2	31.8	36.2	48.8	61.9	40.3

ge of the heads' brown ripeness. The incubation period was then minimal, amounting to 26 hours in the steppe wormwood-grain zone and 49 hours in the motley grass-grain zone, while in the second species it was 98 and 71 hours, respectively (Table 2).

The length of the incubation period of dry rot excitants substantially depends on the relative air humidity at the moment of the inoculation, since increased humidity in the motley grass-grain zone slows down the development of the first species and accelerates that of the second at all stages of the heads' inoculation.

This pattern is also revealed during routine investigation of field crops; the first type dominates in natural conditions, the proportion of affected heads being as high as 85% in the wormwood-grain zone and only 73% in the motley grass-grain zone of all the heads infected by dry rot. Similar picture is to be observed in other agroclimatic zones - forest-steppe and forest-meadow.

These features attending the dry rot development gave grounds to apply certain definite methods of reducing its virulence and improving the seeds' sowing qualities.

Of considerable importance among them is

Table 2

Inoculation Period of Dry Rot Excitants (days)
1968-73

Phase of the heads' development at the moment of inoculation	Wormwood-grain zone			Motley grass-grain		
	relative air humidity, %	incubation period		relative air humidity	incubation	
		Rh.nodosus	Rh. nigricans		Rs. nodosus	Rh. nigricans
Opening	51	0	0	63	0	0
Flowering	47	0	15	58	0	11
End of flowering	45	4	12	56	5	9
Green	44	3	9	53	4	7
Yellow	37	2	6	48	3	5
Brown	32	1	4	44	2	3
Frequency of species, %	-	85	15	-	73	27

Table 3

Influence of Phyto-Cleaning on Dry Rot, Yield and Quality of Seeds

1970-74

Period	Number of sick heads at the moment of harvesting, %	Seed yield, c/ha		Seed quality, %	
		year of phyto-cleaning	next year	germinating power	germination
Check (without phyto-cleaning)	8.9	17.0	17.2	90.2	93.6
Yellow ripeness	0.4	15.6	18.6	94.7	97.3
Before harvesting	0.0	15.3	19.1	95.0	97.5
$NSP_{0.95}$ c/ha	-	0.8	0.9	-	-

phyto-cleaning, i.e. the removal and obligatory burning of the sick heads.

Experience has shown that this method is most effective before harvesting, because it helps completely eliminate dry rot from the crops and improve the quality of the sowing material, though yield goes down by 1.4-1.7 c/ha as compared to check crops, i.e. those not subject to phyto-cleaning. Yet this reduction is fully compensated by a significant increase in the marketable seeds' yield by 1.4-1.9 c/ha next year (Table 3).

Economic calculations show that phyto-cleaning is compensated 12-15-fold, not to say of it helping to improve the marketable qualities of seeds.

Early harvesting helps considerably reduce the impact of the disease; 8-32 days after mass flowering the heads' infection with dry rot decreases to 0.9% as against 11.2% in the check samples (harvesting in 40-45 days, Peredovik variety). Though the seeds' treatment with fungicides used in production and their preliminary soaking in solutions of the microelements such as boron, cobalt, manganese, molibdenum and zink, do not free the crops from the disease, they noticeably reduce its virulence, increasing the mass of 1,000 seeds and improving their sowing qualities.