V.A. Bartenev, USSR

PECULIARITIES OF SUNFLOWER SEED TREATMENT BY GRAIN CLEANING MACHINES

It is considered advisable to use one and the same means of mechanization for the post-harvesting treatment of the productive part of grain and oil crops yield. However, not all grain machines and equipment are equally efficacious in sunflower seed treatment. The main reason are distinctive features of this crop which are not always taken into account when appropriate technical means are created and operated.

Sunflower heap is characterized by high content of foreign substances similar to the main crop in size and ability to be carried by air flow; it has low bulk, density, wide variation of physical and mechanical indices, while kernels must be oriented more precisely to ensure their passage through sieve holes, etc. All this makes for a specific use of grain cleaning techniques (wind sieving machines, pneumatic table separators and other equipment) for sunflower seed treatment.

As is well known sunflower strongly reacts to conditions of growing. The larger the density, the more is the fraction of large kernels reduced in the yield and the larger is the fraction of small seeds. If the seed material is grown following the recommendations of Academician V.S. Pustovoit, the kernels showing the thickness under 2.5 mm (which are considered to be by-products according to existing standards) practically cannot be met; lots of seeds obtained from commercial fields have a considerable proportion of such seeds, sometimes up to 50%. Hence, the maximum effectiveness of cleaning operation may be obtained after considering the granulometric composition of a

given seed lot.

As a result of numerous trials the following ranges of sieve sizes were obtained for sunflower: 3.5, 4.0, 5.0, 6.0, 6.5, 7.0, 8.0, 9.0, 10.0 mm diameter round holes, and 1.7, 2.0, 2.25, 2.5, 3.0, 3.25, 3.5, 4.0, 4.5 and 5.0 mm width of oblong holes. As experiments have shown, such a set of sieves fully suits the arranging of different schemes of cleaning and grading the seeds of all sunflower varieties cultivated in this country.

Experiments have shown that each scheme corresponds to its own kinematic and technological regime. For sieve cleaning machines (inclination angle of sieves 5÷8°, amplitude of oscillations 7.5 mm) optimal values of the above mentioned factors are in the following range: frequency of oscillations is from 350 to 450 per min., unit load is from 30 to 300 kg/dm per hour.

Optimal parameters of air flow in aspiration ducts of windrowing-sieve machines are taken depending on goals of cleaning and composition of the initial material. At primary cleaning aimed at elimination of light impurities, the speed of air flow does not exceed 4 m/sec., at secondary treatment of seed material it is 4÷6 m/sec., and when heavy impurities (e.g. sclerotiae of white rot) are separated the speed is over 10 m/sec.

The efficiency of such windrowing-sieve machines is substantially affected by the stability of feeding the seed material into the machine, the state and adjustion of the mechanism of seed cleaning, the moisture content of impurities.

Utilizing pneumatic separation tables we meet with the necessity to adjust the angles and amplitudes of the table, the unit load, the speed of air flow and some other parameters. Depending on the goals set there can be a need to modify the aerodynamic field in accordance with local properties of the seed

Table

Results of Seed Sorting on a Modified Pneumatic Table

Sowing fraction	Seed traits	Initial material	Fractions of table output						
			1	2	3	4	5	6	7
I	Specif. weight g/cub.cm	0.694	0,755	0.756	0.706	0.700	0.668	0,655	0.530
	Mass,1000 seeds, g	108	115	115	110	109	107	101	90
II	Spec. weight g/cub.cm	0,700	0,764	0.740	0,726	0.704	0,689	0,630	0,539
	Mass, 1000 seeds, g	92	99	97	95	94	90	84	73
III	Spec. weight g/cub.cm	0,735	0,796	0,770	0,765	0.740	0,725	0,666	0,616
	Mass, 1000 seeds, g	81	88	86	84	83	80	75	68

mass on the table, to form the process of seed distribution along the exit length of the table, and to even but initial seed material in dimensions (see table).

From these data we can see that when sorting the sowing fractions on the modified pneumatic table the specific weight of seeds is gradually reduced from the first fraction output to the seventh fraction. For example is the seeds separated during the sorting the second sowing fraction have the specific weight of 0.764 in the first output, then during subsequent outputs this index is lower: at the 3rd it is 0.726, at the 5th 0.689 and at the 7th 0.539 g/cub.cm. Along with the separation of the mixture on the specific weight the seeds are classified by mass.

In every sowing fraction seeds with larger specific weights have larger mass, the correlation coefficient being 0.984 + 0.996. Without respective corrections such relation is not obtained.

In sum, the utilization of technological means which consider the peculiarities of sunflower seeds allows to increase the effectiveness of the seed cleaning machinery, to improve the quality of the end product, reduce losses and increase labour productivity during seed processing.