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***Poltorets’kyi S. P.*,** *Candidate of Agriculture Sciences, Associate Professor of Uman’ National University of Horticulture,*

***Poltorets’ka N. M.*,** *Candidate of Agriculture Sciences, Associate Professor of Uman’ National University of Horticulture*

THE DEPEN­DENCE OF YIELD AND QUALITY INDICATORS OF SEEDS OF MILLET, DEPENDING ON THE TIME AND METHOD OF SOWING

*The result of researches with the application of method of correlation pleiads of the influence of different terms and methods of sowing on sowing qualities and crop capacity of the seeds of broomcorn millet under conditions of unsustainable moisturizing of the southern part of Right-Bank Forest-Steppe zone were analyzed.*

***Keywords:*** *millet, variety, seeds, maternal plants, the first seed offspring, term of sowing, method of sowing, sign-indicator, correlation pleiad.*

**Formulation of the problem.** Quality of seed material is predetermined by genetic potential of a variety, terms of developing maternal plants and, especially, environmental conditions where a new organism is developing. These provisions need to consider that the study of biological objects is connected with their multiple-factor links with the environment, among themselves, as well as signs within the same species, causing significant difficulties in learning the subject. Existing methods of analysis of multiple-factor links are significantly associated with intuition and subjective interpretations due to lack of reliable objective criteria. However, method of correlation pleiades differs from them by the possibility of objective separating of essential links from non-essential ones, objective placing of signs on the degree of their importance, ability to establish the structure of interconnections within any complex of signs [5].

**Analysis of recent research and publications which began a solution of this problem.** Selecting the optimum sowing terms for a long time was and still is, according to many researchers, a major factor in the formation of high-yield crops of millet. Thus, according to W. Bin [6], for violations of optimal sowing terms weather conditions significantly influence on yielding properties of seed during its formation. However, despite the considerable antiquity and a large number of studies on optimizing sowing terms of millet there is still no consensus. Sometimes, even in the same scientists differences in the recommendations on the choice of sowing terms are found. So, I. M. Yelagin in one of the works [2] recommends starting sowing when warming soil up to 10–12 °C at a depth of seeding and in the other work the same author [2] notices that sowing in non-warmed soil retards germination, so the most optimum is the temperature at 18–20 °C. Thus, summarizing the results of studies in the scientific literature, we concluded that studying effect of sowing terms on sowing qualities and yielding properties of seeds at different ways of sowing has a schematic and single character, and in conditions of unstable humidity of Right-Bank Forest-Steppe of Ukraine, currently this matter has not been studied completely. This is the relevance and novelty of the chosen direction of research.

**The aim of the study** was to determine the optimal conditions for cultivation of seed millet in Right-Bank Forest-Steppe zone of Ukraine which will provide the maximum productivity of high-quality seeds.

Achieving this goal can be done by solving such *problems* – to determine and analyze multiple-factor links of forming highly productive seed sowing of varieties of seed millet by selecting optimal terms and methods of sowing as well as conditions that will ensure improvement of sowing qualities and yielding properties of seeds.

**Material and methods of the research.** In order to determine optimal terms and methods of sowing maternal plants during 2009–2011 on the experimental field of Uman’ National University of Horticulture we had a three-factor field experiment which involved studying mutual influence of varietal characteristics (*factor A*), term (*factor B*) and sowing method (*factor C*) for sowing qualities and yielding properties of millet seeds. Terms of the research have the character of unstable moisture. Results of these studies were analyzed earlier [4].

Varieties of seed millet which were sown – Slobozhanske (mid-ripening, variety *aureum* variety) and Lana (mid-ripening, *flavum* variety). Terms of sowing were from the first decade of May till the first decade of June, control – the second period (the middle of the second decade of May). Methods for sowing were regular line and wide row ones with a width between rows – 15 and 45 cm and seeding norms – 3,5 and 2,0 million of similar seeds/ha respectively.

In order to identify modification changes that have occurred in seeds under the influence of agroecological factors it was sown in recommended period for the research area – the middle of the second decade of May (2010–2012) by ordinary row method in a norm of 3,5 million of seeds/ha (the first seed offspring).

For comparison of vitality and viability indicators we offered *the generalized indicator of seed quality* which is the average percentage among a certain group of indicators (energy (*%*), rate (*days*) and simultaneity of seed germination (*plants/day*), its growth power (*%*) and laboratory similarity (*%*)) [4].

To have correlation pleiad the degree of influence of growing conditions was determined on the formation of sowing qualities and yielding properties of millet seed and interconnection of yield level of plants of the first offspring with a number of agronomic characteristics of seeds from maternal plants: **A** –energy of seed germination (*%*); **B** – speed of seed germination (*days*); **C** – simultaneity of seed germination (*plant/day*); **D** – power of seed growth (*%*); **E** – laboratory seed germination (*%*); **F** –generalized indicator of seed quality (*%*); **G** – weight of 1000 seeds (g); **H** – test value (*g/l*); **I** – uniformity of seeds (%); **J** – seed hoodness (*%*); **K** – millet yield (c/ha); **L** – protein content in seeds (*%*); **M** – fat content in seeds (*%*); **Y1** – yield of maternal plants (*c/ha*); **Y2** – yield of plants of the first seed offspring (*c/ha*). To have pleiades correlation links at the level of r > 0,5 are involved [1, 5].

**Results of the research.** According to statistical calculations and obtained results a powerful integrated correlation pleiad was built (see pic.) with 15 signs. Thus, between yield of maternal plants (**Y1**) and plants of the first seed offspring (**Y2**) the direct connection has not been found (it was positive, however, was only r=0,41 which does not meet the construction of this pleiad – r <0,5).



**Picture***. Correlation pleiad of dependencies of sowing qualities and yielding properties of millet seeds formed under the influence of term peculiarities and sowing methods, the average for 2008–2012.\**

*Note*: Numbers in the figure – the value of correlation coefficients after the decimal point.

However, both these indicators were indirectly linked through uniformity of millet caryopsides (**I**), millet yield (**K**) and the generalized indicator of seed quality (**F**). Thus, the biological interpretation of the content of these links indicates that the highest productivity of maternal plants of millet (**Y1**) is directly related (r=0,53±0,03) with greater uniformity of caryopsides (**I**) which is achieved due to their better fullness. Thus, leveled grain weight provides increasing of cereal production (**K**) (r=0,51±0,04).

In turn, high uniformity of caryopsides (**I**) significantly improved the quality of seed material (**F**) – among them there was a close correlation (r=0,67±0,00). From both of these indicators (**I, F**) on high direct level yielding properties of seeds and yield capacity of crops of the first seed offspring depended (**Y2**) – respectively r=0,68 and 0,85±0,00.

It was also found that increased seed productivity of maternal plants (**Y1**) on the close direct level is associated with the integrated quality indicator (**F**) – r=0,69±0,00. In turn, this indicator (**F**) on high direct level depended on seed germination energy (**A**) and laboratory similarity (**E**) (r=0,85±0,00), its simultaneity (**C**) (r=0,86±0,00) and power of seed growth (**D**) (r=0,80±0,00) is inversely correlated with the speed of germination (**B**) (r=-0,88±0,00). In addition, all studies submitted for laboratory quality indicators of seed material also had direct close to each other (**A, C, D, E**) and with a speed of seed germination (**B**) respectively inverse correlations at r=0,67–0,85±0,00 and r=-0,60–0,82±0,01 and formed a five-way star in the center of which there was a generalized criterion of sowing quality of seed material (**F**).

The above mentioned laboratory parameters of quality of millet seed material on a close level were associated with increased productivity of seed crops (**Y1**): just in accordance with the strength of growth (**D**); energy of seed germination (**A**); laboratory similarity (**E**) and germination simultaneity(**C**) – r = 0,55 –0,81±0,03 and inversely with the rate of seed germination (**B**) – r = -0,68±0,01.

Grain productivity of millet grown from seeds formed under different terms and methods of sowing (**Y2**) directly and on a close level correlated with indicators (**A, C, D, E**) and with a speed of seed germination (**B**) inversely – respectively r = 0,71–0,87±0,00 and r = -0,82 ± 0,00.

Thus, results of the research give the following **conclusions**:

1. Between productivity of maternal plants and millet plants of the first seed offspring there is a direct correlation of medium strength (r = 0,41).

2. Between productivity of maternal plants and laboratory and technological indicators of seed quality there are strong correlations that are associated with it through the generalized indicator of quality of seed material and millet yield.

3. The generalized indicator and separately each of the studied laboratory parameters of quality of seed material on a high level influence on the formation of grain yield of plants of the first seed offspring.

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