The development of the educational and applied database in MS Access for selection and genetic research

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Abstract. The article deals with the issues of the development and prospects of the database “Genetic formulae of spring barley in Eastern Siberia on hordein-coding loci” in MS Access use in the educational and production process. The stages of designing the database structure, selection and location of information in the database management system (DBMS) MS Access objects are given. The database presents the certification of the spring barley varieties of the Krasnoyarsk scientific-research agricultural institute selection according to genetic formulae, as well as genetic hordein formulae of Siberian modern varieties and local ancient forms.

Currently, information technologies provide wide opportunities for the creation of electronic catalogues, computer databases (DB) of genetic and economically valuable indicators of agricultural samples [1].

Genetic protein markers are increasingly used in selection and seed work for varietal identification and seed control. The genetic diversity of genotypes and populations is estimated by electrophoretic spectra of spare proteins, varieties are identified and registered in the form of protein formulae, and the relationship of the obtained alleles with economically valuable indicators is determined [2, 3].

The article discusses the development stages of the database “Genetic formulae of spring barley in Eastern Siberia on hordein-coding loci”. The relevance of the database is dictated by:

- the absence of the unified electronic source of genetic formulae and spectra visualization of the Siberian variety hordeins;
- the possibility of its multifunctional use directly in selection and seed production, as well as in the educational process by students and teachers, specialists in the field of agricultural science and crop production.

In our opinion, when forming digital databases for solving selection and genetic problems in production and education, it is most reasonable to use existing instrumental software tools, where complex “programming” problems have already been solved. MS Office software package is the most common automation package in educational and industrial organizations of AIC (agro-industrial complex). The advantages of DBMS (Data Base Management System) MS Access are graphical forms...
of data presentation, development of a button interface for the user, the ability to quickly add data, as well as data exchange with other MS Office applications.

The database we are considering is created in the MS Access application. The database includes the following objects: 5 tables and their forms, queries, reports, macros. The logical data scheme is shown in figure 1.

The database contains the research results on the spectra of hordeins (Hrd) of Siberian varieties and local forms. The data were imported from the monograph “Agro-ecological determination of spring barley in Eastern Siberia by hordein-coding loci” [4]. The following list and type of database fields are designed: Number (Counter), Variety name (Text), Origin (Text), hordein A. B. F. formulae (Text), Spectrum photo (Attachment), Alleles (Text), VIR catalogue number (Text), Additional information (Hyperlink), Biotype 1 by Hrd A. B. F. (Text), Biotype 2 by Hrd A. B. F. (Text).

Basic database objects can be hidden from the user. The user works in the database using macros and the button interface of the Main form. The Main form (the Main form can also be opened with a macro) includes buttons to open the forms of all tables and search for data from the database (figure 2). All forms of tables open in the Datasheet mode and in the Form mode.

Figure 1. Logical database structure.

Figure 2. The Main database form.
The database presents the certification of spring barley varieties of the Krasnoyarsk scientific-research agricultural institute selection (table “Varieties of KSRAI”) and includes genetic hordein formulae of 14 Krasnoyarsk varieties and their parent forms (16 varieties). The developed form of this table allows viewing photos of hordein spectra of varieties according to their genetic formulae (figure 3).

![Varieties of Krasnotarsk Institute](image)

**Figure 3.** Viewing photos of hordein spectra of variety “Rassvet”.

Genetic formulae of hordeins of Siberian modern varieties (72 varieties) and local ancient forms (40 samples) are presented in the corresponding tables. Figure 4 shows a fragment of the table “Formulæ of modern Siberian varieties hordeins”.

![Table “Formulae of modern Siberian varieties hordeins”](image)

**Figure 4.** Table “Formulae of modern Siberian varieties hordeins”.
The database also has the ability of drawing the spectrum picture according to genetic hordein formula. It was decided to design the separate tables-catalogues of allelic variants of Hrd A and Hrd B loci in order to compile the spectrum according to the formula without uploading the photo of a particular variety.

A variety of queries, including parametric ones, have been developed for purposeful search of records. For example, the database offers a search for information on the name of varieties (figure 5), as well as search by genetic formula Buttons to execute these commands are displayed in the Main form.

![Figure 5](image_url)

Figure 5. Using the query parameter to search by the variety name.

To search by the variety name, the dialogue box for entering the parameter value of the corresponding query button is filled, the information is displayed in the Form mode, where you can not only find the data, but also print them.

The database provides the ability to enter new records through table forms and update the data in all tables.

Thus, the concept of creating an information identification database on genetic markers of spring barley for the use in selection and seed production has been developed. The algorithms worked out on this particular variety can be transferred to other varieties.

Automation of storage, search and visualization of professional information is focused on the use directly by specialists of the agro-industrial complex, including poorly trained computer users.

The database contains scientific and applied terms that have the maximum frequency of use in educational and information publications, in the practice of selection and seed production, and allows to develop interdisciplinary practical tasks that ensure the formation of professional competencies of students through the development of skills of using information products.

References
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