

**MINISTRY OF AGRICULTURAL POLICY
AND FOOD OF UKRAINE**

Poltava State Agrarian Academy

Department of Selection,
Seed Studies and Genetics

**BASICS OF SCIENTIFIC
RESEARCH IN AGRONOMY**

Methodological instructive regulations for an individual work of the
students of the Agronomy Faculty of education and qualification
level - "Bachelor"

Poltava – 2019

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The methodological instructive regulations for an individual work of the students of the Agronomy Faculty of education and qualification level "Bachelor" are given in.

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INTRODUCTION

The methodological instructive regulations of the course "Basics of scientific research in agronomy" for the individual work of students of the Agronomy Faculty contain recommendations to study separate matters, a list of self-check questions and a glossary of scientific terms; a list of recommended literature is given in the end.

While studying the discipline, it is important to know the history of the research, the contribution of foreign and domestic scientists in the development of this science, its state and role in modern agronomy, to realise its objectives and perspectives.

The basis of modern requirements to future specialists lies in the following points: the knowledge of plant biology, the technology of their cultivation and ability to use modern IT equipment for processing the results of the experiment or economic activity.

According to the program of the discipline, the students' individual work is divided into two options: writing a synopsis of the literature sources on the subject of the diploma paper; the generation of a plan to run a field experiment and observations in it.

The methodological instructive regulations of the discipline "Basics of scientific research in agronomy" for the individual work of students of the Agronomy Faculty of education and qualification level 6.090101 - "Bachelor" will be useful for the students, postgraduate students and applicants in agriculture while having a work experience internship, laying out and conducting the experiment in field conditions.

TOPIC 1. WRITING A SYNOPSIS AND DRAWING UP LITERATURE SOURCES ON THE SUBJECT OF THE DIPLOMA PAPER

***Purpose:** To learn how to analyse scientific problems on the subject of the diploma paper, organise information, logically combine it in the context of the given task. To master the methods for drawing up a literature review and a list of bibliographic sources.*

The completion of the diploma paper is the final stage of the student's educational and qualification training aimed at developing the skills of individual work and acquirement in planning and conducting a research, analysis and organisation of the scientific facts and experimental data, programming of possible technological solutions, formulating the conclusions and offers. In addition, it is also important to form students' skills in writing and designing a scientific manuscript work, as they are necessary for the future professional activity of the graduate.

The preparation of a research should be preceded by the choice of a topic, the definition of tasks and objects of the research, the study of the actual state of the question, the nomination of the working hypothesis, the development of the scheme and methodology of the experiment.

The diploma paper is carried out on the basis of the detailed study of scientific literature in the specialty (monographs, articles, abstracts of theses, periodical literature including foreign, normative literature, etc.)

and, most importantly, on the results of the independent research and experimental work.

The literature review covers the study state of the issue the topic of the diploma paper is devoted to.

When introducing the literature review, a reference in square brackets (for example: as noted by H.P. Zhemela [14] ...) is obligatory to the sources included in the section "List of references".

To complete this section with no difficulties, it is necessary to prepare **bibliographic cards** in advance. They include the authors, a brief summary of the book (or article) and paragraphs of the necessary information (indicating the pages) regarding the subject of the work (see example).

Sample bibliographic card

Zhemela H.P. Fertilisers, harvest, grain quality. – K.: Harvest, 1991. – 136 p.

The principles of the efficient use of fertilisers, the effect of doses and the ratio of nutrients in the main application and fertilisation on the yield and quality of the grain of the field crops depending on soil fertility, forecrops, soil cultivation, genetic, biological and physiological properties of varieties are laid out in.

The achievements in science and the best practices in the fertilisation of grain crops: winter wheat, winter rye, spring barley, corn are generalised in.

The methods of diagnostics and plants' needs for fertilisers, the principles of crop programming and forecast of the grain quality are laid out in.

P. 39. In all phases of the vegetation, winter wheat grows most intensively at ambient temperatures of 20-25 °C.

P.62. Barley is characterised by a very rapid absorption of nutrients.

However, in view of the poorly developed root system, this culture has a low digestibility of hard-to-get forms of nutrition elements.

P. 70 Corn is in need of having digestible forms of nutrients in the soil. During the vegetational season, their consumption is unequal ...

In this way, no less than 30 cards should be completed, which will greatly simplify the writing of "Section 1. The literature review " and the correct design of "LIST OF REFERENCES" (Table).

Examples of drawing up a bibliographic description in the list of literary sources

Characteristics of the source	Drawing up example
Books: One author	<p>1. Basil the Great. Homilies / Basil the Great; [translated from ancient Greek by L. Zvonska]. – Lviv: Svichado, 2006. – 307 p. - (Sources of the Christian East. The Golden Age of patristics of the IV-V cent., №. 14).</p> <p>2. Korenivsky D.H. The destabilising effect of parametric white noise in continuous and discrete dynamic systems / Korenivsky D.H. – K.: Institute of Mathematics, 2006. – 111 p. - (Mathematics and its applications) (Contributions / Institute of Mathematics, National Academy of Sciences of Ukraine, vol. 59).</p> <p>3. Matyukh N. D. What is more expensive than silver-gold / Nataliya Dmytrivna Matyukh. – K.: Assembly of business circles: Institute of social image making, 2006. – 311 p. - (Jewellers of Ukraine; vol. 1).</p> <p>4. Shklyar V. Elemental: [novel] / Vasyl Shklyar. – Lviv: Kalvaria, 2005. – 196, [1] p. - (Script).</p>
Two authors	<p>1. Matyash I. B. Activities of the Extraordinary Diplomatic Missions of the UPR in Hungary: history, memories, archive doc. / I. Matyash, Yu. Mushka. – K.: Kyiv-Mohyla Acad., 2005. – 397, [1] p. - (Library of the scientific annual "Diplomatic Ukraine"; no. 1).</p> <p>2. Romovska Z. V. Family Law of Ukraine / Z. V. Romovska, Yu. V. Chernyak. – K.: Precedent, 2006. – 93 p. - (Law Library, Lawyer's Library) (Materials for the qualification examinations to obtain the Certificate to practice law, no. 11).</p> <p>3. Suberlyak O. V. Technology to process polymeric and composite materials: textbook [for college undergraduates] / O. V. Suberlyak, P. I. Bashtannyk. – Lviv: Rastr-7, 2007. – 375 p.</p>

Three authors	1. Akoff R. L. Idealised project conception: how to prevent the tomorrow's crisis today. Building the future of the organisation / Akoff R. L., Mahidson D., Eddison H. D.; translated from English by F.P. Tarasenko. – Dnepropetrovsk: Balance Business Books, 2007. – XLIII, 265 p.
Four authors	1. Principles of the resources rationing for the crop production / [Vitvitsky V.V., Kyslyachenko M.F., Lobastov I.V., Nechyporuk A. A.]. – K.: Scientific research institute "Ukragropromproduktynnist", 2006. – 106 p. - (Library of the AIC Specialist. Economic Standards). 2. Mechanisation of the processing industry of the agro-industrial complex: [textbook for students of the vocational-technical schools.] / O. V. Hvozdev, F. Yu. Yalpachyk, Yu. P. Rogach, M. M. Serdyuk. – K.: Vyshcha osvita, 2006. – 478, [1] p. - (VTE: vocational-technical education).
Five and more authors	1. Psychology of management / [Vlasov P.K., Lipnitsky A.V., Lushchikhina I.M., etc.]; ed. H. S. Nikiforov. - [3rd ed.]. – Kh.: Humanitarny tsentr, 2007. – 510 p. 2. Formation of a healthy lifestyle for youth: a study guide for workers of the social services for families, children and youth / [T. V. Bondar, O. H. Karpenko, D. M. Dykova-Favorska and others.]. – K.: Ukrainian Institute of social research, 2005. – 115 p. - (Series "Formation of a healthy lifestyle for youth": in 14 books, book 13).
No author	1. History of St. Michael's Gold-Plated Monastery / [Author of the text V. Klos]. – K.: Hrani-T, 2007. - 119 p. - (The bounds of the world). 2. The resurrection of the dead: Ukrainian baroque drama: anthology / [arranged, structured, translation and notes by V. O. Shevchuk]. – K.: Hramota, 2007. – 638, [1] p. 3. Body or personality? Female corporeality in selected small Ukrainian prose and graphics of the end of the XIX th and early XX th centuries: [anthology / arranged: L. Taran, O. Lahutenko]. – K.: Hrani-T, 2007. – 190, [1] p. 4. Problems of typological and quantitative lexicology: [collection of research papers / scientific ed. by Kaliushchenko V. and others]. – Chernivtsi: Ruta, 2007. – 310 p.
Multivolume document	1. History of the National Academy of Sciences of Ukraine, 1941-1945 / [arranged by L. M. Yaremenko and others]. – K.: National library of Ukraine named after V.I. Vernadsky, 2007 - (Sources on the history of science in Ukraine). Part 2: Annexes. – 2007 – 573, [1] p. 2. Interstate standards: a 6 vol. catalogue / [contributors Kovaleva I. V., Rubtsova E. Yu .; ed. Ivanov V. L.]. – Lviv: RDC "Leonorm-Standart", 2005. - (Series "Normative base of the

	<p>enterprise"). Vol. 1. – 2005. – 277 p.</p> <p>3. Darova A. T. God works in mysterious ways ...: (The daughter of the public enemy): trilogy / A. Darova. – Odessa: Astroprint, 2006 - (Compositions: in 8 books / A. Darova, book 4).</p> <p>4. Kucheryavenko N.P. The course of the tax law: Special part: in 6 volumes / N.P. Kucheryavenko. – Kh. Pravo, 2002.- Vol. 4: Indirect Taxes. – 2007 – 534 p.</p> <p>5. Rehabilitated by history. Zhytomyr region: [in 7 volumes]. - Zhytomyr: Polissya, 2006. - (Scientific and documentary series of books "Rehabilitated by history": in 27 volumes / chief editorial staff: Tronko P.T. (head) [and others]). Book 1 / [regional editorial staff: Sinyavska I. M. (head) and others.]. – 2006. 721, [2] p.</p> <p>6. Bondarenko V. H. Probability theory and mathematical statistics. Part 1 / V.H. Bondarenko, I.Yu. Kanivska, S. M. Paramonova. – K.: NTUU "KPI", 2006. – 125 p.</p>
Materials of conferences, congresses	<p>1. Economy, management, education in the system of reforming the agroindustrial complex: materials of the All-Ukrainian conference of young agrarian researchers ["The youth of Ukraine and agrarian reform"], (Kharkiv, October 11-13, 2000) / Ministry of agricultural policy, the Kharkiv State Agricultural University named after V. V. Dokuchayev. – Kh.: Kharkiv State Agricultural University named after V. V. Dokuchayev, 2000. – 167 p.</p> <p>2. Cybernetics in modern economic processes: the volume of texts as delivered during the republican multi-university research-to-practice conference / State Statistics Committee of Ukraine, Institute of Statistics, Accounting and Audit. – K.: SSCU, 2002. – 147 p.</p> <p>3. Materials of the IX Congress of the Association of Ukrainian banks, June 30, 2000, information letter – K.: Association of Ukrainian banks, 2000. – 117 p. - (Special issue: AUB decennary).</p> <p>4. Estimation and justification of the continuation of the structures' resource elements: proceedings of the conference, June 6-9, 2000, Kyiv. Vol. 2 / executive editor V. T. Troshchenko. – K.: NAS of Ukraine, Institute of strength problems, 2000. - p. 559-956, XIII, [2] p. - (Resurs 2000).</p> <p>5. Problems of the computational mechanics and structural solidity: the collection of research papers / science editor V.I. Mossakovsky. – Dnipropetrovsk: Navchalna knyha, 1999. – 215 p.</p> <p>6. Riskology in economics and entrepreneurship: the collection of research papers adapted from the international research-to-practice conference, March 27-28, 2001 / Ministry of Education and Science of Ukraine, State Tax Administration of Ukraine [and others]. – K.: KNEU: Academy of STA of Ukraine, 2001. – 452 p.</p>

Advance sheets	<p>1. Shyliayev B. A. Calculations of parameters of the radiation damage of materials by neutrons of the source of the NSC KIPT / ANL USA with a subcritical assembly controlled by the electron accelerator / Shyliayev B. A., Voyevodin V. N. – Kh. NSC KIPT, 2006. –19 p. - (Advance sheet / NAS of Ukraine, National Scientific Centre "Kharkov Institute of Physics and Technology", KIPT 2006-4).</p> <p>2. Panasyuk M.I. On the accuracy of determination of the activity of solid radioactive wastes by gamma-methods / Panasyuk M.I., Skorbun A.D., Sploshnoy B.M. – Chornobyl: Institute for Safety of the NPP of the National Academy of Sciences of Ukraine, 2006 – 7, [1] p. - (Advance sheet / NAS of Ukraine, Institute for Safety of the NPP; 06-1).</p>
Deposited research papers	<p>1. Sociological research of small groups of population / V.I. Ivanov [and others]; Ministry of Education of Russian Federation, Financial Academy. – M., 2002. –110 p.– Deposited in the All-Union Institute of Scientific and Technical Information 13.06.02, № 145432.</p> <p>2. Razumovsky, V.A. Management of marketing research in the region / V.A. Razumovsky, D.A. Andreyev. – M., 2002. –210 p. – Deposited in the Institute of Scientific Information for Social Sciences of the Russian Academy of Sciences 15.02.02, №139876.</p>
Dictionaries	<p>1. Geography: a dictionary and handbook / [compiled by Tsipin V. L.]. – Kh. Khalimon, 2006. – 175, [1] p.</p> <p>2. Tymoshenko Z.I. Bologna process in action: a dictionary and handbook of terms and concepts for the organisation of teaching and learning processes in higher education establishments / Z. I. Tymoshenko, O. I. Tymoshenko. – K.: Yevropeisky universitet, 2007. –57 p.</p> <p>3. Ukrainian-German Thematic Dictionary [compiled by N. Yatsko and others.]. – K.: Karpenko, 2007. –219 p.</p> <p>4. European Union: a dictionary and handbook / [edited and arranged by M. Marchenko]. – 2nd edition, update – K.: K.I.S., 2006. –138 p.</p>

Atlases	<p>1. Ukraine: eco-geographical atlas: dedicated to the World Science Day in the name of peace and development according to the decision of the 31st session of the UNESCO general conference / [science editorial staff: S. S. Kurulenko and others]; Council for the Study of Production Forces of Ukraine of the National Academy of Sciences of Ukraine [and others]. - / [science editorial staff: S. S. Kurulenko and others]. – K.: Varta, 2006 – 217, [1] p.</p> <p>2. Anatomy of memory: the atlas of schemes and drawings of the leading pathways and structures of the nervous system involved in the memory processes: the manual for students and doctors / O. L. Drozdov, L. A. Dzyak, V. O. Kozlov, V. D. Makovetsky. – 2nd edition, amplified edition – Dnipropetrovsk: Porohy, 2005. –218 p.</p> <p>3. Kuerda J. Atlas of botany / Jose Kuerda; [translated from Spanish by V. Y. Shovkun]. – Kh.: Ranok, 2005. –96 p.</p>
Legislative and regulatory documents	<p>1. The Criminal Procedural Code of Ukraine: as of December 1, 2005 / The Verkhovna Rada of Ukraine. – Official edition – K.: Parliament publishing house, 2006, 207 p. - (Library of the official publications).</p> <p>2. Medical statistics: regulatory collection / ordering and executive editor V. M. Zabolotko. – K.: Municipal Science Information and Analysis Centre of medical statistics: Medinform, 2006 – 459 p. - (Regulatory legislative documents).</p> <p>3. Operation, procedure and timing of inspecting the protective equipment of vessels, apparatuses and pipelines of thermal power stations: SUC-N EE 39.501: 2007. – Official edition – K.: Field Reserve Value Fund of Power Industry Development: Ministry of Fuel and Energy of Ukraine, 2007. - VI, p.74 - (Regulatory document of the Ministry of Fuel and Energy of Ukraine. Instruction).</p>
Standards	<p>1. Graphic symbols used on the equipment. Marker and check (ISO 7000: 2004, IDT): DSTU ISO 7000: 2004. - [Effective as on 2006-01-01]. - K.: Derzhspozhyvstandart of Ukraine 2006. – IV, 231 p. - (National Standard of Ukraine).</p> <p>2. Water quality. Glossary of terms: DSTU ISO 6107-1: 2004 - DSTU ISO 6107-9: 2004. - [Effective as on April 1, 2005]. – K.: Derzhspozhyvstandart of Ukraine, 2006. –181 p. - (National standards of Ukraine).</p> <p>3. Safety requirements to the control and laboratory electrical equipment. Part 2-020. Additional requirements to laboratory centrifuges (EN 61010-2-020: 1994, IDT): DSTU EN 61010-2-020: 2005. - [Effective as on 2007-01-01]. – K.: Derzhspozhyvstandart of Ukraine, 2007. – IV, 18 p. - (National Standard of Ukraine).</p>

Catalogues	<p>1. Interstate standards: catalogue: in 6 vol. / [cataloguer Kovaleva I.V., Pavlyukova V.A.; editor Ivanov V. L.]. – Lviv: RDC "Leonorm-standard, 2006. - (Series" Normative base of the enterprise "). Vol. 5. – 2007. –264 p. Vol. 6. – 2007. –277 p.</p> <p>2. Memorials of history and art of the Lviv region: manual / [compiled by M. Zobkiv and others.]. – Lviv: Novy Chas, 2003. – 160 p.</p> <p>3. Universytetska knyha: Autumn, 2003: [catalogue]. - [Sumy: Univ. knyha, 2003]. – p.11</p> <p>4. Hornitskaya I.P. Catalogue of plants for phytodesign works / Hornitskaya I.P., Tkachuk L.P. – Donetsk: Lebed, 2005. –228 p.).</p>
Bibliographic indexes	<p>1. Kuts O. S. Bibliographic index and annotations of the candidates' theses defended in the specialised Academic Board of the Lviv State University of Physical Culture in 2006 / O. Kuts, O. Vatsaba. – Lviv: Ukrayinski tekhnolohiyi, 2007. –74 p.</p> <p>2. Systematised index of materials on the criminal law published in the Bulletin of the Constitutional Court of Ukraine for 1997-2005 / [arranged by Kyrys B. O., Potlan O. S.]. – Lviv: The Lviv State University of Internal Affairs, 2006. –11 p. - (Series: Bibliographic References; issue 2).</p>
Theses	<p>1. Petrov P.P. The activity of young stars of the solar mass: the thesis of the ... doctor of physical and mathematical sciences: 01.03.02 / Petrov Petro Petrovych. – K., 2005. –276 p.</p>
Abstracts of theses	<p>1. Novosad I. Ya. Technological support to manufacture sections of the operating elements of the flexible screw conveyors: abstract of a thesis to get the academic degree of PhD in Engineering Science: special issue as of 05.02.08 "Technology of mechanical engineering" / I. Ya. Novosad. – Ternopil, 2007. – 20, [1] p.</p> <p>2. Nguen Shi Dang. Modelling and prediction of macroeconomic indicators in the system of public finances management decision support: abstract of a thesis to get the academic degree of PhD in Engineering Science: special issue as of 05.13.06 "Automated control and progression systems of the information technology" / Nguen Shi Dang. – K., 2007. – 20 p.</p>
Author's certificates	<p>1. A. c. 1007970 USSR, IPC³ W 25 J 15/00. Gripping assembly for the nonoriented parts of a shaft type / V. S. Vaulin, V.H. Kemaykin (USSR). – No. 3360585 / 25-08; stated 23.11.81; published 03.03.83, Bulletin. No. 12</p>

Patents	<p>1. Patent 2187888 Russian Federation, IPC⁷ N 04 W 1/38, N 04 J 13/00. Transceiver / Chuhayeva V.I.; applicant and patent owner is the Voronezh Scientific Research Institute of Communication. – No. 2000131736/09; stated 18.12.00; published 20.08.02, Bulletin No. 23 (II part).</p>
Part of the book, periodical, continuing edition	<p>1. Kozina Zh. L. Theoretical basics and results of the practical application of the system analysis in scientific research in sports games / Zh. L. Kozina // The theory and methods of physical education. – 2007. – No. 6. – P.15-18, 35-38.</p> <p>2. Hranchak T., Information and analytical structures of the libraries in the conditions of democratic transformations / Tetyana Hranchak, Valery Horovy // Library bulletin. – 2006. – No. 6. – P. 14-17.</p> <p>3. Valkman Yu. R. Modelling of NON-factors - the basis of intellectualisation of computer technologies / Yu. R. Valkman, V. S. Bykov, A. Yu. Rykhalsky // System research and information technologies. – 2007. – No. 1. – P. 39-61.</p> <p>4. Ma Shuin Problems of psychological training in the system of physical education / Ma Shuin // The theory and methods of physical education. – 2007. – No. 5. – P. 12-14.</p> <p>5. Regional peculiarities of the mortality rate of the population of Ukraine / L.A. Chepelevska, R.O. Moiseyenko, H. I. Batorshina [and others] // Bulletin of the social hygiene and public health organisation of Ukraine. – 2007. – No. 1. – P. 25-29.</p> <p>6. Valova I. New principles of Basel II agreement / I. Valova; translated from English by N.M. Sereda // Banks and banking systems. – 2007. – Vol. 2, No. 2. – P. 13-20.</p> <p>7. Zerov M. Poetic activity of Kulish // Ukrainian writing of the XIX century. From Kulish to Vynnychenko: (essays on the latest Ukrainian writing): articles / Mykola Zerov. – Drohobych, 2007. – p. 245-291.</p> <p>8. Tretyak V.V. Possibilities of using knowledge bases to design explosive stamping technology / V.V. Tretyak, S.A. Stadnyk, N.V. Kalaytan // Modern state of using the intermittent energy sources in industry: international scientific and technical conference, October 3-5, 2007: lecture notes – Kh., 2007. – P. 33.</p> <p>9. Chorny D. Urban governance: the burden of problems, the charm of civilisation / D. M. Chorny // On the left side of the Dnipro: problems of modernisation of Ukrainian cities: (end of the XIX-beginning of the XX century / D. M. Chorny – Kh. 2007. – Part 3. – P. 137-202.</p>

Electronic resources	<p>1. Bogomolny B. R. Medicine of the extreme cases [Electronic resource]: The manual for the students of medical universities of III-IV levels of accreditation / B. R. Bogomolny, V. V. Kononenko, P. M. Chuyev. – 80 min / 700 MB. – Odessa: Odessa Medical University, 2003. - (Library of pre-med) – 1 electronic mirror disk (CD-ROM); 12 cm – System requirements: Pentium; 32 Mb RAM; Windows 95, 98, 2000, XP; MS Word 97-2000. – Sinterbox name.</p> <p>2. Distribution of the population of the most numerous nationalities by sex and age, marital status, linguistic characteristics and level of education [Electronic resource]: according to the All-Ukrainian population census 2001 / Government Statistics Board of Ukraine; editor O.H. Osaulenko. – K.: CD-publication "Infodysk", 2004. – 1 electronic mirror disk (CD-ROM): coloured; 12 cm - (the All-Ukrainian population census, 2001). – System requirements: Pentium-266; 32 Mb RAM; Windows 98/2000 / NT / XP CD-ROM. – The title screen name.</p> <p>3. Library and information accessibility in the modern world: electronic resources in science, culture and education: (the results of the 10th International conference "Crimea-2003") [Electronic resource] / L. Y. Kostenko, A. O. Chekmariov, A.H. Brovkin, I.A. Pavlusha // Library bulletin – 2003. – No. 4. – P. 43. – Access mode to the journal. : http://www.nbu.gov.ua/articles/2003/03klinko.htm.</p>
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Notes:

1. The bibliographic description is made according to DSTU GOST 7.1: 2006 "System of standards for information, library and publishing. Bibliographic record. Bibliographic entry. General requirements and drafting rules".

2. The description is made of the elements that are divided into compulsory and optional. The bibliographic entry may contain only compulsory or both compulsory and optional elements. Compulsory entries contain bibliographic information that ensures the document identification. It is given in any description.

The spaces between the signs and the description elements are compulsory and used to distinguish grammatical and prescribed punctuation marks.

3. In the list of published works of the applicant, given in the abstract, it is necessary to indicate the surnames and initials of all its co-authors irrespective of the publication type.

Check Questions:

1. What is the main purpose of the diploma paper's completion?
2. What precedes the preparation of the research?
3. Why do we use the bibliographic cards?
4. What references are selected for the "List of literary sources"?
5. Give examples of a bibliographic entry of a monograph in the list of literary sources.

TOPIC 2. DESIGNING A FIELD EXPERIMENT AND OBSERVATIONS IN IT

***Purpose:** To make a plan of keeping records and observations in the experiment. To carry out a preliminary experimental scheme and research program, to identify the scientific methods that will be used in the course of the work.*

Scientific research by means of the field experiment involves three stages: planning, conducting, and processing the results.

Planning is the definition of a task and objects of the research, the development of a scheme of the experiment, the choice of a land plot and optimal area of the field experiment.

Therefore, to input the information on the content, scheme of the field experiment, its conditions and the field results obtained from the research, the "Journal of observations and records in the field experiment", being the original document, is used. It consists of five sections: the first section is "General information about the experiment", the second one is called "Passport of the experimental plot", the third section is "Agrotechnology in the experiment", the fourth one is called "Observations and records in the plants research ", the fifth section is named "Observations and records while studying environmental conditions".

To reduce the volume of records in the journal, the names of the variants can be marked with letters and numbers with a preliminary indication of their full informational content.

**MINISTRY OF AGRICULTURAL POLICY OF UKRAINE
POLTAVA STATE AGRARIAN ACADEMY**

Faculty of Agronomy

name of the department

**JOURNAL
OF THE OBSERVATIONS AND RECORDS IN THE FIELD
EXPERIMENT WITH AGRICULTURAL CULTURES**

name of the experiment

Location _____

Research director _____

Performers: _____

Poltava 20__

1. General information about the experiments

(the scheme of the experiment, the explication of the land plot, area of the experimental plot, a schematic plan for placing the experiment)

1. Place of the experiment layout _____

2. Culture _____

3. Variety _____ Reproduction _____

4. Year of the experiment layout _____

5. Year of the harvest records _____

6. Subject and section's name _____

7. Name of the experiment _____

8. Director _____

9. Performers: _____

Scheme of the experiment

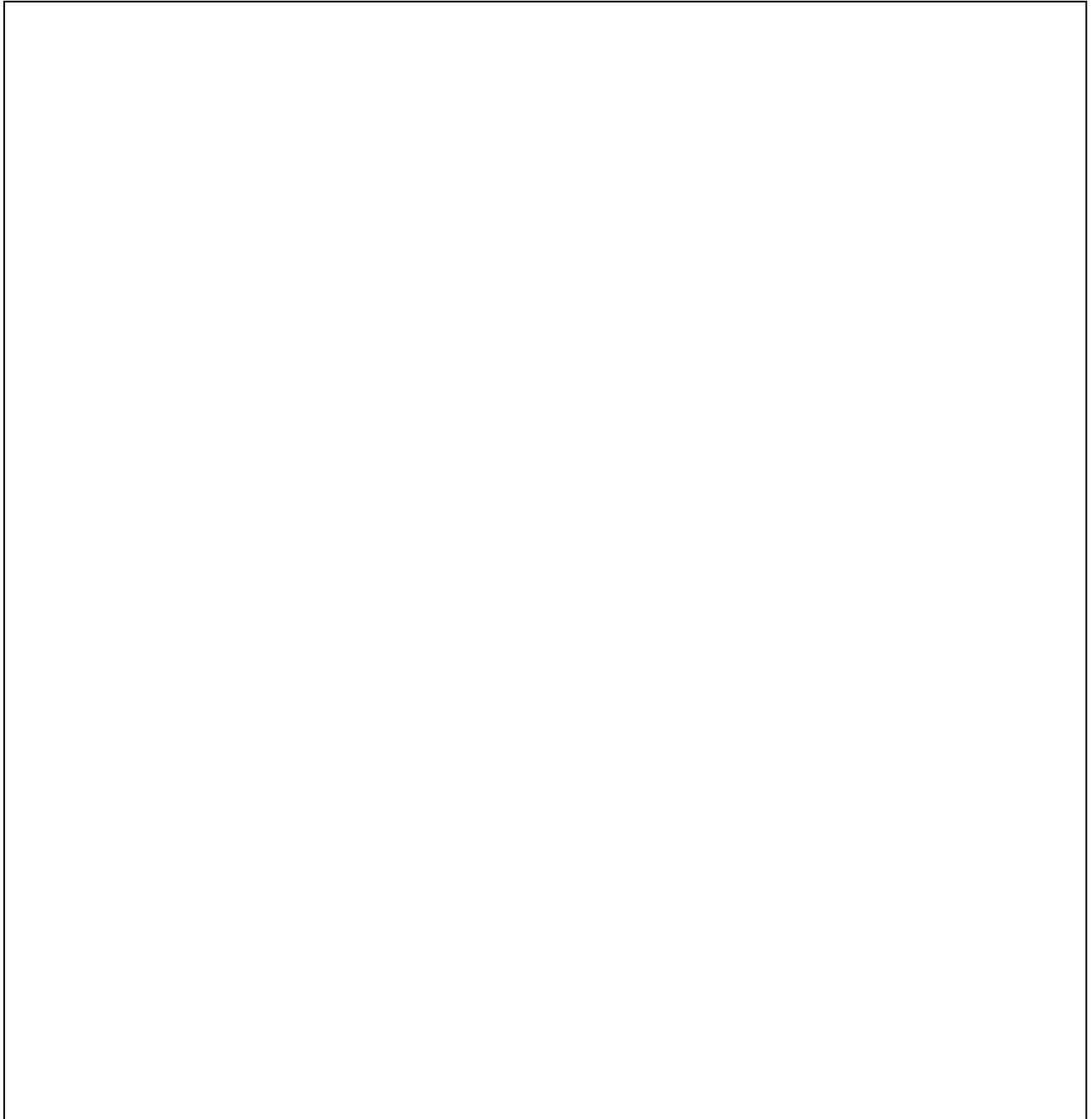
Variant number	Variants' content
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Specification of the land plot area

Parameters	Parameters			
	Sizes, m		Number	Area, m ²
	length	width		
Seedling plot				
Record part of the plot				
Side borders of the plots				
Ending borders of the plots				
Borders along the perimeter of the experiment				
Lanes between the layers of the plots				
Total experimental area				

Schematic plan for placing the experiment

(the placement and numeration of plots and repetitions, the cardinal points, slope direction, distance from the fixed points (rappers) in the field are indicated in the plan)



The area of the plot is _____ m² including its record part of _____ m²

The replication is ____ -fold. The experimental area is _____ ha

2. Passport of the experimental plot

1. The name of the land, shift of crops, field _____

2. The relief of the experimental plot (equal, elevated, slope and slope direction) _____

3. Soil

4. Soil grading

5. The depth of the arable layer _____ cm

6. Forecrops, their fertilisers and other peculiarities of the cultivation technology

Year	Culture	Yield, t/ha	Fertilisers distribution per 1 ha		Chemical melioration and other peculiarities of the technology
			mould, t	NPK, kg of AI	
200_					
200_					
200_					

3. Agrotechnology in the experiment

3.1. Seeds (seed and planting stock) and their preparation for planting

- a) variety _____
 b) varietal purity _____% e) weight 1000 seed _____ g
 c) seed kindred _____% f) seed suitability for crops _____
 d) seed purity _____%

Dressing and other types of seed treatments (preparation, dose, time, date, month)

3.2. Seeding (planting)

- a) seeding time (date, month) _____
 b) seeding (planting) method _____
 c) seeding rate per 1 ha, pcs/kg _____
 d) mark of the seed drill _____
 e) depth of the seed burying, cm _____
 f) rolling, date and means of rolling _____

3.3. Fertilisation

Variant number	Name of fertiliser	Nutrient content, %	Fertilisers weight		Time of application (month, date)	Method of application (broadcast effusion, subsurface distribution)
			dt/ha	kg/plot		
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						

1. OBSERVATIONS AND RECORDS IN THE FIELD EXPERIMENT WITH PLANTS

4.1. Phenological observation of plants (effective dates of growth stages and development of plants)

Variant number	Replication	Sowing (planting)	Stages of growth and development of plants										Full maturity			Harvesting	
			early	full	early	full	early	full	early	full	early	full					
1.																	
2.																	
3.																	
4.																	
5.																	
6.																	
7.																	
8.																	
9.																	
10.																	
1.																	
2.																	
3.																	
4.																	
5.																	
6.																	
7.																	
8.																	
9.																	
10.																	
1.																	
2.																	
3.																	
4.																	
5.																	
6.																	
7.																	
8.																	

4.2. Stand count

Variant number	Replication	Date of records	The count is made on a sample area of 1-3 m ²							
			that of plants				that of sprouts			
			1	2	3	per 1 m ²	1	2	3	per 1 m ²
1.										
2.										
3.										
4.										
5.										
6.										
7.										
8.										
9.										
10										
1.										
2.										
3.										
4.										
5.										
6.										
7.										
8.										
9.										
10.										
1.										
2.										
3.										
4.										
5.										
6.										
7.										
8.										
9.										
10.										

4.3. Determination of the leaf-area duration in the phase of _____

Variant number	Replication	Date of records	Number of plants in a sample, pcs.	Number of stalks in a sample, pcs.	Leaf weight in a sample, g	Number of leaf punchings, pcs.	Weight of punchings in a sample, g	Area of one punching, cm ²	Area of all the punchings in a sample, cm	Number of plants per 1 ha, thous. pcs.	Leaf area per 1 ha, thous. m ²
1.											
2.											
3.											
4.											
5.											
6.											
7.											
8.											
9.											
10.											
1.											
2.											
3.											
4.											
5.											
6.											
7.											
8.											
9.											
10.											
1.											
2.											
3.											
4.											
5.											
6.											
7.											
8.											
9.											
10.											

Continuation of Table 4.3.

Variant number	Replication	Date of records	Number of plants in a sample, pcs.	Number of stalks in a sample, pcs.	Leaf mass in a sample, g	Number of leaf punchings, pcs.	Weight of punchings in a sample, g	Area of one punching, cm ²	Area of all the punchings in a sample, cm	Number of plants per 1 ha, thous. pcs.	Leaf area per 1 ha, thous. m ²
1.											
2.											
3.											
4.											
5.											
6.											
7.											
8.											
9.											
10.											
1.											
2.											
3.											
4.											
5.											
6.											
7.											
8.											
9.											
10.											
1.											
2.											
3.											
4.											
5.											
6.											
7.											
8.											
9.											
10.											

Continuation of Table 4.3.

Variant number	Replication	Date of records	Number of plants in a sample, pcs.	Number of stalks in a sample, pcs.	Leaf mass in a sample, g	Number of leaf punchings, pcs.	Weight of punchings in a sample, g	Area of one punching, cm ²	Area of all the punchings in a sample, cm	Number of plants per 1 ha, thous. pcs.	Leaf area per 1 ha, thous. m ²
1.											
2.											
3.											
4.											
5.											
6.											
7.											
8.											
9.											
10.											
1.											
2.											
3.											
4.											
5.											
6.											
7.											
8.											
9.											
10.											
1.											
2.											
3.											
4.											
5.											
6.											
7.											
8.											
9.											
10.											

Continuation of Table 4.3.

Variant number	Replication	Date of records	Number of plants in a sample, pcs.	Number of stalks in a sample, pcs.	Leaf mass in a sample, g	Number of leaf punchings, pcs.	Weight of punchings in a sample, g	Area of one punching, cm ²	Area of all the punchings in a sample, cm	Number of plants per 1 ha, thous. pcs.	Leaf area per 1 ha, thous. m ²
1.											
2.											
3.											
4.											
5.											
6.											
7.											
8.											
9.											
10.											
1.											
2.											
3.											
4.											
5.											
6.											
7.											
8.											
9.											
10.											
1.											
2.											
3.											
4.											
5.											
6.											
7.											
8.											
9.											
10.											

4.4. Structural analysis of plants

Plant number	Plant height, cm	Plant (bush) weight, g	Number of stalks (sprouts) on 1 plant (in a bush), pcs.	Average number of joints on a plant (sprout), pcs.	Number of spikes (spadices, beans etc.) on 1 plant, pcs.	Average length of a spike (spadix, bean, head, root crop, tuber etc.), cm	Average number of spikes in the ear (rows in the spadix, grains in the bean etc.), pcs.	Number of grains (tubers, seeds etc.) in 1 plant, pcs.	Average number of grains in 1 ear (head, panicle etc.), pcs.	Weight of grain (seeds, tubers, root crops etc.) in 1 plant, g	Average weight of grain in 1 ear (panicle, head etc.), g
1.											
2.											
3.											
4.											
5.											
6.											
8.											
9.											
10.											
11.											
12.											
13.											
14.											
15.											
16.											
17.											
18.											
19.											
20.											
21.											
22.											
23.											

4.5. Yield records

Variant 1. Harvest date _____ Variant 2. Harvest date _____

Figures	Replication				Mean		Figures	Replication				Mean
	1	2	3	4				1	2	3	4	
Plot area under gathering, m ²							Plot area under gathering, m ²					
Weight of agronomic vegetable production (AVP) from a plot, kg							Weight of agronomic vegetable production (AVP) from a plot, kg					
Weight of the major part of AVP, kg							Weight of the major part of AVP, kg					
Yield of the major part of AVP, dt/ha							Yield of the major part of AVP, dt/ha					
Harvest moisture, %							Harvest moisture, %					
Yield of the major part of AVP by moisture standard, dt/ha							Yield of the major part of AVP by moisture standard, dt/ha					
Gather of the minor part of AVP, kg							Gather of the minor part of AVP, kg					
Gather of the minor part of AVP from 1 ha, dt							Gather of the minor part of AVP from 1 ha, dt					

Continuation of Table 4.5.

Variant 1. Harvest date _____ Variant 2. Harvest date _____

Figures	Replication				Mean	Figures	Replication				Mean
	1	2	3	4			1	2	3	4	
Plot area under gathering, m ²						Plot area under gathering, m ²					
Weight of agronomic vegetable production (AVP) from a plot, kg						Weight of agronomic vegetable production (AVP) from a plot, kg					
Weight of the major part of AVP, kg						Weight of the major part of AVP, kg					
Yield of the major part of AVP, dt/ha						Yield of the major part of AVP, dt/ha					
Harvest moisture, %						Harvest moisture, %					
Yield of the major part of AVP by moisture standard, dt/ha						Yield of the major part of AVP by moisture standard, dt/ha					
Gather of the minor part of AVP, kg						Gather of the minor part of AVP, kg					
Gather of the minor part of AVP from 1 ha, dt						Gather of the minor part of AVP from 1 ha, dt					

Continuation of Table 4.5.

Variant 1. Harvest date _____ Variant 2. Harvest date _____

Figures	Replication				Mean	Figures	Replication				Mean
	1	2	3	4			1	2	3	4	
Plot area under gathering, m ²						Plot area under gathering, m ²					
Weight of agronomic vegetable production (AVP) from a plot, kg						Weight of agronomic vegetable production (AVP) from a plot, kg					
Weight of the major part of AVP, kg						Weight of the major part of AVP, kg					
Yield of the major part of AVP, dt/ha						Yield of the major part of AVP, dt/ha					
Harvest moisture, %						Harvest moisture, %					
Yield of the major part of AVP by moisture standard, dt/ha						Yield of the major part of AVP by moisture standard, dt/ha					
Gather of the minor part of AVP, kg						Gather of the minor part of AVP, kg					
Gather of the minor part of AVP from 1 ha, dt						Gather of the minor part of AVP from 1 ha, dt					

4.7. Determination of unit and weight of 1000 grains, g

Variant number	Replication	Date of records	Weight of 1 l of clean grain		Grain unit, g
			1	2	
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

Variant number	Replication	Date of records	Weight of 500 grains, g			Weight of 1000 grains, g
			1	2	3	
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

5. Observing and accounting the environmental conditions

5.1. Weather conditions

Figures		Months											
		January				February				March			
		1	2	3		1	2	3		1	2	3	
1. Precipitation, mm	Long-term average												
	For 200_												
2. Ambient temperature, °C	Long-term average												
	For 200_												
3. Snow cover, cm	Long-term average												
	For 200_												
4.	Long-term average												
	For 200_												
5.	Long-term average												
	For 200_												
6.	Long-term average												
	For 200_												
7. -----	Long-term average												
	For 200_												

Continuation of Table 5.1.

Figures		Months											
		January				February				March			
		1	2	3		1	2	3		1	2	3	
1. Precipitation, mm	Long-term average												
	For 200_												
2. Ambient temperature, °C	Long-term average												
	For 200_												
3. Snow cover, cm	Long-term average												
	For 200_												
4.	Long-term average												
	For 200_												
5.	Long-term average												
	For 200_												
6.	Long-term average												
	For 200_												
7. -----	Long-term average												
	For 200_												

Continuation of Table 5.1.

Figures		Months											
		January				February				March			
		1	2	3		1	2	3		1	2	3	
1. Precipitation, mm	Long-term average												
	For 200_												
2. Ambient temperature, °C	Long-term average												
	For 200_												
3. Snow cover, cm	Long-term average												
	For 200_												
4.	Long-term average												
	For 200_												
5.	Long-term average												
	For 200_												
6.	Long-term average												
	For 200_												
7. -----	Long-term average												
	For 200_												

Continuation of Table 5.1.

Figures		Months											
		January				February				March			
		1	2	3		1	2	3		1	2	3	
1. Precipitation, mm	Long-term average												
	For 200_												
2. Ambient temperature, °C	Long-term average												
	For 200_												
3. Snow cover, cm	Long-term average												
	For 200_												
4.	Long-term average												
	For 200_												
5.	Long-term average												
	For 200_												
6.	Long-term average												
	For 200_												
7. -----	Long-term average												
	For 200_												

Continuation of Table 5.1.

Figures		Months											
		January				February				March			
		1	2	3		1	2	3		1	2	3	
1. Precipitation, mm	Long-term average												
	For 200_												
2. Ambient temperature, °C	Long-term average												
	For 200_												
3. Snow cover, cm	Long-term average												
	For 200_												
4.	Long-term average												
	For 200_												
5.	Long-term average												
	For 200_												
6.	Long-term average												
	For 200_												
7. -----	Long-term average												
	For 200_												

5.2. Determination of the structure of the arable layer, soil water storage, water capacity and optimum moisture

Figures	Variants											
	first			second			third			fourth		
1. Density test of the solid part, g/cm												
a) weight of the tight soil, g												
b) weight of a densimeter with water, g												
c) weight of a densimeter with water and soil, g												
Density of the solid part (D), g/cm ³												
2. Density test of the soil consistency, g/cm³												
a) cylinder height, cm												
b) cylinder radius, cm												
c) weight of the empty cylinder, g												
d) weight of a cylinder with soil, g												
Density of the soil consistency, g/cm ³												
3. Determination of the soil moisture, %												
a) weight of the empty sample bottle, g												
b) weight of a sample bottle with soil before desiccation, g												
B) weight of a sample bottle with soil after desiccation, g												
Soil moisture, %												
4. Soil structure determination:												
a) number of aggregates (%) under dry sieving of size (mm):												
>10												
10-0,25												
>1												
>0,25												
<0,25												
Coefficient of soil pedality												
b) number of aggregates (%) when sieving under water of size (mm):												
>3												
>1												
>0,25												
<0,25												
Coefficient of water-resisting property												

5.3. Records of the weed infestation of crops

a) before the application of herbicides

Variant number	Replication	Determination date	Number of weed plants, pcs/m ²					Weight of air-dry weeds, g/m ²					Main weed types	
			1	2	3	x	per 1ha	1	2	3	x	per 1ha		
1.														
2.														
3.														
4.														
5.														
6.														
7.														
8.														
9.														
10.														...

b) after the application of herbicides

Variant number	Replication	Determination date	Number of weed plants, pcs/m ²					Weight of air-dry weeds, g/m ²					Main weed types	
			1	2	3	x	per 1ha	1	2	3	x	per 1ha		
1.														
2.														
3.														
4.														
5.														
6.														
7.														
8.														
9.														
10.														...

Test questions:

1. What stages do scientific research by means of the field experiment involve?
2. What is a research planning?
3. List source documents during the research.
4. What is the “Journal of observations and records in the field experiment” used for?

GLOSSARY

Knowledge is a tried and tested result of reality cognition, its adequate reflection in human consciousness.

Cognition is a process of movement of a human thought from ignorance to knowledge (the reproduction of objective reality in human consciousness is key).

Scientific cognition is a research distinguished by its specific goals and objectives, methods for obtaining a test of new knowledge.

Scientific idea is a form to reflect in mind a new understanding of objective reality.

Hypothesis is a scientific suggestion put forward to explain any phenomena, processes or causes that determine the given consequence.

Proof is a procedure whereby any statement is verified.

Abstract is a written form of a report on a specific topic, the content only informs but not convinces of something; an informative edition which defines the summary of the content of scientific research.

Thesis is a systematic description of key concepts, thoughts, observations, here are no details, explanations, illustrations, etc.

Argument is the basis, proof used to justify, confirm something.

Theory is the highest form to generalise and systematise the knowledge, which gives a full picture of regularities and substantial connections of reality.

Axiom is a concept perceived with no proof due to its obviousness.

Postulate is a statement perceived within a certain scientific theory as the truth without proof and serves as an axiom.

Principle is the prime postulate of any scientific theory, doctrine, science or world outlook, serves as the first and most abstract definition of the idea, as the initial form to systematise the knowledge.

Scientific activity is an intellectual creative work aimed at getting and using new knowledge.

Scientific research is a purposeful study with the help of scientific methods, phenomena, and processes, an analysis of the influence of various factors on them as well as studying the interaction between the phenomena to get decisions conclusively proved and useful for science and practice.

Fundamental (theoretical) research is a scientific theoretical activity aimed at the cognition of laws governing the behaviour and interaction of the basic structures of nature, society and a man.

Applied research is an academic, scientific and engineering activity aimed at using the results of fundamental research for various practical tasks, upon which new equipment, methods of the production setup, technological processes, etc., are under development in order to get a direct economic effect in specific industries.

Object of the research is what the cognitive activity of the researcher is directed to. It is a process or a phenomenon that generates a problem situation and is chosen for research.

Subject of the research stands for the properties typical of the scientific cognition studied for a certain purpose, it is the definition of a certain "perspective" of the research as an assumption of the most important characteristics of the object.

Validity stands for the criteria to estimate the quality of the test.

Method is a means to an end, a way to study a phenomenon, which determines a systematic approach to their scientific cognition and establishment of the truth.

Research methodology is a rule system of using methods, procedures and ways to conduct any research.

Comparison is a process of correlating objects or phenomena of reality in order to establish similarities or differences between them as well as finding something general, inherent that may be common to two or more objects of the research.

Generalisation is a logical process of transition from singular to general or from less general to more general.

Experiment is a scientifically directed test, observations of the phenomenon under study under certain specific conditions allowing its multiple reproductions when replicating these conditions, or it is a testing of the knowledge of the phenomena under study in controlled or artificially created conditions.

Deduction is a form of a trustworthy inference from general to partial, where the conclusion about particular cases of the multiple sets is made on the basis of knowledge of the general properties of the whole multiplicity.

Induction is a research method and a way of thinking whereby the general conclusion is based on partial references.

Synthesis is a method of cognition, a consequence of connecting particular parts or features of the object into a single whole.

Analysis is a partition of the whole into its constituent parts (sides, characters, properties) with a view to study them thoroughly.

Correlation analysis is a research of the dependence between the independent variables.

Factorial analysis is the establishment of multivariate connections of the variables on grounds of several characters.

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ANNEXES

The placement of variants by iambic method

st	2	st	3	st	4	st	5	st
st	3	st	2	st	5	st	4	st
st	5	st	2	st	3	st	4	st

The placement of variants by dactyl method

st	2	3	st	4	5	st	3	5	st	2	4	st	4	5	st	3	2	st
----	---	---	----	---	---	----	---	---	----	---	---	----	---	---	----	---	---	----

THE METHOD OF FULL RANDOMISATION

2	1	3	2
1	3	2	1
3	1	2	3

THE METHOD OF RANDOMISED REPETITIONS

8	6	4	1	3	7	2	5	1	9	1	5	2	7	3	1	9	4	6	8
9	8	6	4	1	5	3	1	2	7	4	2	1	3	7	9	8	5	6	1

the method of the Latin square

5	1	4	6	3	2
1	3	5	2	6	4
6	4	2	1	5	3
2	5	3	4	1	6
4	6	1	3	2	5
3	2	6	5	4	1

the method of the Latin rectangle

4	9	11	1	7	2	8	12	10	6	3	5
1	5	2	6	10	12	3	4	7	11	9	8
12	6	8	3	4	9	1	5	11	2	7	10
3	7	10	5	8	11	9	2	6	4	1	12

the method of split plots

a₃						a₄						a₁						a₅						a₂						a₂						a₁						a₄						a₅						a₆					
b ₁	b ₃	b ₂	b ₁	b ₂	b ₃	b ₃	b ₁	b ₂	b ₁	b ₃	b ₂	b ₃	b ₂	b ₃	b ₁	b ₁	b ₃	b ₂	b ₃	b ₁	b ₂	b ₁	b ₂	b ₃	b ₂	b ₁	b ₃	b ₁	b ₃	b ₂	b ₁	b ₂	b ₃	b ₂	b ₁	b ₃	b ₁	b ₃	b ₂																				
a₁						a₅						a₄						a₂						a₃						a₄						a₂						a₅						a₃						a₁					
b ₃	b ₂	b ₁	b ₂	b ₃	b ₁	b ₂	b ₁	b ₃	b ₂	b ₁	b ₃	b ₂	b ₃	b ₁	b ₃	b ₂	b ₁	b ₂	b ₃	b ₁	b ₁	b ₃	b ₂	b ₁	b ₃	b ₂	b ₁	b ₃	b ₂	b ₁	b ₃	b ₂	b ₁	b ₃	b ₂	b ₁	b ₃	b ₂	b ₁																				

