



## COURSE REGISTRATION FORM

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| <b>Teacher</b>    | Svetlana Jeremić                         |
| <b>University</b> | State University of Novi Pazar           |
| <b>Course</b>     | Technology of starch and modified starch |
| <b>Target</b>     | Agricultural Middle Schools              |
| <b>Type</b>       | blended                                  |
| <b>Duration</b>   | 2 days - 16 hours                        |

### Description

Starch is the one of the most widespread polymers of glucose and one of the major carbohydrate which is used in the human diet. Because of its significance, the technology of production and processing of starch developed and thrived for centuries. Today starch processing is one of the most important industrial branches. For this reason, for Agricultural High School teachers is very important to gain more knowledge on the quality of raw materials used in the manufacture of starch, as on the quality and using of starches from different botanical genesis. Since growing conditions of corn, wheat and potatoes, that are the basic raw materials in European Union for production of starch, and then modified starch, influence to the quality and quantity of starch, and to the possibility of its further use, thereby and cost-effectiveness of its processing.

Industry production of starch hydrolysates, and therefore starch-based sweeteners, strong growth from year to year. The development of starch hydrolysate technology today attaches great importance. Cost-effectiveness of starch-based sweeteners however, depends on the quality of starch, and thus the quality of the starting raw materials.

Teachers of Agricultural High School during this course will acquire basic theoretical knowledges about the starch production and modified starch production technologies, then theoretical knowledges about methods of testing the quality of starch, as well as depending of the production cost-effectiveness on the quality and the botanical genesis of the starting raw material. That acquired knowledges they will be able to use later in order to enrich the teaching process, in terms of connectivity, for example knowledges about different melioration applications with aim at obtaining raw materials of adequate quality. Also, knowledge of starch production technology from different raw materials could be used for organizing additional workshops within the agricultural high schools.

Our country has the potential to maybe one day be exporter of some of the raw materials used in the production of starch, or to achieve significant results in that area. On the other hand, teachers in agricultural high schools educate workpeople who are trained in an organized and planned agricultural production. Therefore, it is important to first teachers acquire basic knowledges about the technologies of production of starch and modified starches, and thus the knowledges of how the



success of this technology depends on the quality of the starting material, and then to be able to transfer this knowledges to their students. In order to farmer produce quality and market competitive raw material for the technological process, it is necessary to know the basics of the technological process. This type of knowledge is useful to demonstrate to the students the applicability of the knowledge they acquired in school, and enables them to better monitor and understand the requirements in the field of agriculture and technology generally. This kind of knowledge can raise the motivation of students to learn and work. The aim of Course in Technology of starch and modified starch is that teachers of secondary agricultural schools gain new and expand existing knowledges in the field of physico-chemical properties of starch and starch granule, then to gain theoretical knowledges about the different possibilities and ways of using starch-iodine reaction as a method for qualitative and quantitative analysis of starch. A significant part of the Course in Technology of starch and modified starch will be devoted to the description and characterization of starch hydrolysis methods and technological procedures for obtaining a starch hydrolysate, as well as the importance and possibilities of their application in various fields of industry.

### Contents

1. Physico-chemical properties of starch. The structure of the starch granule
2. Starch-iodide reaction - Qualitative and quantitative analysis of starch
3. Amylases and their action on the starch
4. Raw materials for the starch production. Production assortment of starch industry
5. Technology of starch hydrolysis. Production and application of starch-based syrups
6. The production and application of crystalline glucose
7. Production and application of D-sorbitol
8. Dextrin - production and application of high-fructose syrups

### Objectives

1. Establishing and expanding the level of existing knowledges in the field of physico-chemical properties of starch molecule of and starch granule.
2. Understanding the description, characteristics and possibilities of applying methods of qualitative and quantitative analysis of starch using the reaction of starch with iodine.
3. Acquisition of the basic theoretical knowledges about types of amylase enzyme as a catalysts in the process of hydrolysis of starch, as well as the mechanisms of their action in starch enzymatic catalysis.
4. Acquiring knowledges about basic characteristics of technological processes (description of the procedure, characterization, advantages and disadvantages) of extracting the starch from corn, potato and wheat as a primary sources for industrial starch obtaining. Defining the starch industry production assortment.



5. Understanding the description and characteristics of the technological process for the hydrolysis of starch and starch syrup obtaining, as well as acquiring information about the possibilities of application of starch syrup in industry.
6. Understanding the description and characteristics of the technological process for preparing a crystalline glucose as one of the most widely used starch-based sweeteners. Defining the importance and application of crystalline glucose in the diet.
7. Acquiring knowledges about basic characteristics of technological procedures for production some other significant modifications of starch and starch-based sweeteners, such as D-sorbitol, dextrin and high-fructose syrups, and the formulation of possibilities of their application in various types of industry.

### Activities

1. It is planned that the course is two days (16 hours), so the first day it will be talking about topics related to the processes of production and processing of starch, and the second day on topics related to obtaining, processing and application of starch-based modifications.
2. Introduction to each teaching unit imply that the teacher (instructor), through discussion with participants of course, determines amount of their current knowledge related with the subject, and that through discussion with the participants of the course, encouraging their mutual discussion and exchanging of information, refreshes and amendments their knowledges and information related to the teaching unit
3. After determining the current level of knowledges of the participants, the teacher (instructor), if it is judged to be necessary, supplements their knowledges with new information and facts, to the level of knowledge that is necessary for participants to have as a basis for further work. If necessary, the instructor can use a *PowerPoint* presentation (especially when it is necessary to describe the construction and operations of certain machines used in a particular process)
4. Registration of the participants on *Moodle*.
5. Further work would involve gaining knowledges of the relevant details relating to a given topic (the details relating to the description and characteristics of method, or a description and characteristics of the specific techniques). The details concerning a given subject, couipants individually learn using *Moodle* (online) teaching material.
6. After processing the given topic, course participants work individually tests on *Moodle*, which include checking the level of knowledge, understanding, as well as possibility of analysis given issue.
7. The results of the tests instructor and students see immediately, so it would be able to analyze them. Doing on-line tests the students themselves, as the instructor, could see the extent to which course participants have mastered a



certain issue. It would pointed out to each of participants which part of lecture and why he/she did not understand and/or adopt. On the other hand, to the instructor it would be an indicator to which topic should be given more or less attention, or should change approach to an issue.

8. Then through mutual discussion among participants about particular issues, coordinated by the instructor of the course, could be clarified ambiguities.
9. At the end of each working day, and after rounding a whole, the course participants divide into smaller groups. Each group receive a task in which it is necessary to select the most appropriate conditions for specific technological operation (selection of raw materials, hydrolysis conditions and/or machines for specific technological operations). It is necessary that group explain its choice. After finishing the task, groups exchange opinions and views and discuss about their proposed solutions.

**Materials**

1. The computer and projector for theoretical introduction to the teaching unit.
2. The computer with the possibility of using *Moodle* applications
3. Board
4. Printed materials