SECTION 10. TECHNOLOGIES OF CONSUMER GOODS INDUSTRY

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INNOVATIONS IN PROCESSING OF HEMP RAW MATERIAL

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Today, the Institute of Bast Crops of the National Academy of Agrarian Sciences of Ukraine (IBC NAAS) is the main institution for the implementation of the research program of the PSR NAAS 19. "Bast crops". IBC NAAS is a scientific institution with 90 years of research experience in the breeding, cultivation, harvesting, processing of fiber flax and industrial hemp. One of the areas of scientific activity of IBC NAAS is the development, research, implementation of technologies and technological methods of harvesting and processing of all components of the plant of industrial hemp.

Industrial hemp is a technical fibrous plant. Industrial hemp is a socially safe agricultural crop, because the use of industrial hemp products does not cause drug intoxication [1 p. 8; 2 p. 6]. In modern production, industrial hemp is a highly profitable crop, which is manifested in the diversity of opportunities for the use of both hemp raw materials and products of its processing. Industrial hemp is grown to obtain raw materials in the form of straw, stock, seeds. Primary processing of grown hemp raw materials allows to obtain such products as bast fiber, long and short fiber, hemp scutch, oil, oil cake, precipitate, crushed seed, husk, which can be used as a finished product and can be used for further in-depth processing. In turn, in-depth

processing of hemp products allows you to get, in addition to traditional textiles and clothing, as well as nonwovens, insulation, health foods, solid biofuels, building materials, granular feed, feed additives, cellulose products, cosmetics, beverages, sweets, bakery products, etc. [1 p. 8-14; 2 p. 6-13; 3].

Today, there are several ditections of cultivation of industrial hemp, which differ in the final product. The green direction of cultivation involves obtaining only the stem mass with the subsequent production of bast or fiber. The seed direction is intended only for the harvest of seeds. Bilateral direction is used to obtain both stem mass and seed yield [1 p.230-235; 2 s. 79-88]. In production, the emphasis is on bilateral cultivation, because this area is more profitable. This is due to the fact that the farm has the opportunity to get double the profit, both from the sale of seeds (seed products) and from the sale of hemp stock (fiber, hemp scutch).

It should be noted that in the world it is actively developing a new direction of hemp cultivation – medical, which involves the production and processing of vegetative mass [4 p. 6]. However, in Ukraine today the legislation provides for criminal liability for research and work with leaves and inflorescences. Although the IBC NAAS has already created varieties of industrial hemp for therapeutic purposes, the use of which does not change human consciousness.

Terms and technologies of industrial hemp harvesting are determined by the direction of plant cultivation and the final product they want to get. Green hemp plants are harvested in late July and early August using special hemp harvesting equipment. Plants for seeds and of bilateral use are harvested in the first decade of September using highly productive agricultural machinery. IBC NAAS has developed technologies for industrial hemp harvesting, which can reduce energy costs, improve product quality and reduce its cost. The developed technologies are characterized by a high degree of mechanization at all stages of harvesting, the ability to exclude some operations depending on the purpose of harvesting and allow to obtain high quality raw materials [1 p. 235-240; 2 p. 82-85; 5].

Grain harvesters (for harvesting seeds) and clearing harvesters (for harvesting seeds or leaves and inflorescences) are used to harvest the vegetative part of industrial hemp, which are aggregated with many modern combine harvesters. Harvesting of the stem part of industrial hemp is carried out using both domestic and foreign agricultural machines of general purpose. For stalks harvesting use bar or rotary mowers; for breaking stems – water-filling rollers or rotary rakes; for forming and rotation of the roll – rotary rake; to provide elasticity of raw materials – water-filling rollers; when forming packages – roller or bale balers; for loading and unloading works – any equipment with the corresponding hinged equipment. The use of developed technologies allows getting a high-quality seed material and enriched fibrous raw materials in the form of straw or stock [1 p. 235-245; 2 p. 85-88; 6; 7].

For processing of a seed of industrial hemp in IBC NAAS the complex technology of processing of seeds is developed. The developed technology includes the production of basic food hemp products – crushed seed and cold-pressed oil. The technology also combines technological chains of processing waste from the production of crushed seed and oils, which allows obtaining new products in the form of hemp flour, roughage, protein concentrate, granular feed, and solid biofuels.

The peculiarity of the developed technology of obtaining the crushed hemp seed is that the operations of drying of seeds and its further calibration are excluded from the technological chain of production. This became possible due to the use of the crushing mechanism developed in IBC NAAS and the use of reasonable effects on raw materials in the process of separation of the crushed seeds [8]. The use of technology allows to process hemp seeds with a purity of 95,0-99,0% without additional calibration, humidity 6,0-13,0%, and to obtain 28,0-38,0% of the finished product, the contamination of which does not exceed 1,0%.

The technology of cold pressing hemp oil developed in IBC NAAS is characterized by simplicity and insignificant capital costs for production, provides processing of hemp seeds with purity of 97,0-99,0%, humidity of 5,0-11,0%, allows to receive 16,0-22,0% of filtered oil. In parallel with the oil, we obtain a by-product of processing – oil cake – a valuable oil protein raw material that can be used for the production of health foods, and a filtration product –precipitate.

For processing of stalks of a crop of industrial hemp in IBC NAAS the complex of research works in the direction of creation of production lines for processing of raw materials of various degree of aging and quality is carried out. The result of the research was the development together with Hemptechno LLC of the first Ukrainian bast processing line BPL-1 [9]. The line is based on the technology of processing of hemp raw materials, which reduces energy costs and reduces the scutch content in the fiber. The BPL-1 line consists of a roll unwinder, ball-forming, grinding, grooving and shaking machines, a ventilation and dust removal system, a scutch and fibrous waste transportation system. The use of the BPL-1 line allows to obtain high-quality hemp fiber of the same type or bast with a low fire content. The breaking load of the twisted tape of the obtained fiber is 20,5 daN, bast – 26,4 daN. The mass fraction of the scutch of the obtained fiber is 0,2-0.5%, bast – 2,1-4.0%. The obtained bast fiber products have expanded potential in terms of their further use.

As a result, we note that the technologies and technological solutions developed in IBC NAAS allow to obtain raw materials or finished product from all components of the plant of industrial hemp. The use of the proposed measures will be able to satisfy the quality of raw materials of the enterprise for the production of a wide range of natural products.

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