Так максимальный прирост зеленой массы лука-севка составил 46 % и массы корнеплодов редиса – 162 %, выращенных на дерново-подзолистой почве, а максимальный прирост зеленой массы кукурузы, выращенной на песке, составил 120 %, накопление сухой массы – 135 %, высоты роста – 50 %, что соответствует дозе внесения нового состава биоудобрения – 2 т/га.

Результаты микровегетационных опытов по определению оптимального состава биоудобрения представлены на рисунке (*г–е*), анализ которых подтверждает ростстимулирующий эффект его применения. Прирост зеленой биомассы кукурузы по сравнению с контролем достигает 130 %, накопление сухой массы – 120 %, увеличение высоты/длины – до 55 % для состава, содержащего от 10 до 20 % ФКП. Необходимо отметить значительное ростстимулирующее действие композиционного биоудобрения при выращивании рассады кабачка.

Прирост зеленой массы кабачка на песке составил до 360 %, сухой – 370–400 %, длины стебля – до 70 % при применении композиционного биоудобрения, содержащего 10 и 20 % ФКП. Аналогичная тенденция наблюдается при выращивании кабачков на дерново-подзолистой почве. С применением биоудобрения указанного выше состава прирост зеленой массы кабачков составил 42–67 %, длины стебля – до 16 %. Установлено, что увеличение количества ФКП в составе биоудобрения свыше 30 % угнетает рост и развитие исследуемых растений. Наблюдалось снижение прироста зеленой массы и накопление сухой, высоты/длины растений.

Механизм полифункционального действия биоудобрения, по видимому, связан с наличием в нем макро – и микроэлементов, деятельностью микроорганизмов, как входящих в его состав, так и активированных почвенных, а также высоким содержанием органического вещества гумусовой природы, что способствует повышению плодородия.

Таким образом, в результате проведенных микровегетационных лабораторных опытов установлено, что композиционное биоудобрение, включающее 10–20 % ФКП и 90–80 % верхового торфа, оказывает ростстимулирующее действие, а в дозе 2 т/га в пересчете на ФКП является оптимальным количеством для внесения в почву при выращивании овощных и пропашных культур, что согласуется с литературными данными [3].

Список использованных источников

1. Вайшля, О. Б. Биологические активаторы плодородия почв / О. Б. Вайшля, А. А. Ведерникова, А. И. Кин, О. М. Минаева // Наука и инновации XXI века: материалы VI конф. мол. уч. Сургут: Изд-во СурГУ, 2006. – С. 175–177.

2. Гребенникова, В. В. Эффективность биопрепаратов в системе биологического земледелия / В. В. Гребенникова // Успехи современного естествознания. – 2004. – № 2. – С. 99–100.

3. Архипченко, И. А. Полифункциональные микробные удобрения / И. А Архипченко // Наука в России. – 1996. – № 6. – С. 62–64.

Flyurik E.A., Kokhanskaya M.V.,
Bushkevich N.V., Klintsevich V.N.
Belarusian State Technological University

NEW VEGETABLE SHAMPOO BASED ON WASTE PRODUCTION

In last few years population began to pay more attention to their health. The share of people who regularly per for marange of physique exercises to increase their physique training and prevention of diseases caused by sedentary life style is increasing. It is proved that moderate physique exercises can help to prevent illness and mental stress; but over work leads to stress causing

fatigue or different types of damage not only to the internal organs but also to the hair and skin of a person. Fatigue – is a symptom which indicates that a person's health is undermined. It is set off [1] two mechanisms of fatigue: oxidative stress and exhaustion. Intensive physique exercises can stimulate the production and accumulation of excess free radicals which leads to oxidative stress and body damage. That's why in recent decades researches [2] have paid particular attention to the antioxidant effect of flavonoids, to their ability to stop free radicals.

As you know, all plants have certain biologically active substances (BAS), but special interest present tonnage renewable wastes from agriculture and forestry as perspective raw material for obtaining materials that are useful to man, because they have enough raw material base. As a rule, such raw material contain natural BAS, in particular flavonoids, the process of separation them from wastein most cases is more advantageous than their chemical synthesis.

Most of the crop waste under go to destruction in natural conditions, increasing the fertility of soil. However, in terms of intensive agricultural production waste is geographically concentrated and a number of them is too high for natural potential of biodegradation. For example, in the cultivating and conversion of buckwheat sowing, as well as other cereal crops, tonnage waste are formed in the form of straw, fruit shells (shuck, pod, capes) and middlings (or bran). The share of straw from buckwheat in the total above ground mass of plants depends on the variety and is 42–62%. Due to the stability of lingocellulosic complex it is more difficult than other wastes to undergo biodegradation in the environment.In most farms of the country it remains on the fields and usually is burnt or plowed [3].

Incineration reduces the number of pathogens and weeds, but beneficial substances are lost that could increase soil fertility and the atmosphere is polluted.

Strawplowedintothesoilas a result of chemical and biological processes is slowly but disintegrate. However some products of disintegration have a negative effect on plant growth. With an aerobic biodegradation of straw salt sofacetic, propionic and butyric acids are formed, which inhibit, subsequently, germination and growth of plants. Besides, thedecomposition microbial population absorbs nitrogen, depleting the soil. This is also there as on for lower yields later. That's why neither incineration nor plowing is an efficient way to recycle waste.

Currently studies are carry in gout in direction of development of complex technology of buckwheat straw conversion to secrete utility components, lower its volume and accordingly preparing for accelerated decomposition in the environment. It should be noted that realization of this direction is associated with a number of problems, namely: necessity to select method sand modes for isolating the complex of valuable substances and their purification from mixtures, secondary substances, as well as selection of conditions in which maximum extraction of useful substances will be achieved with preserving their properties, reduce waste and eliminate their negative environment impact.

Thus buckwheat (*Fagopyrumesculentum*) and blueberry (*Vaccinium*) were in the area of our attention.

Buckwheat has been studied by scientists for a very long time and every years great number of works are published on the issues of breeding, cultivating and processing, and several dissertations are defended. As a raw material for industrial processing a mixture of leaves and flowers of buckwheat is used. This is due to the fact that this plant raw material contains a big amount of BAS. For example, during bloom the content of the main active substance rutosidum in it reaches a maximum (2–7%) of the mass of air-dry raw material. The vegetative mass of a plant contains a large amount of organic acids (citric, malic, oxalic) [4]. Besides, the aerial part of plant contains a whole complex of vitamins, minerals, micro– and macronutrients, essential amino acids. In cosmetology extracts and drawing from buckwheat are used. Folic acid which is part of buckwheat, has a benefit influence on the recovery processes and is part of means for rejuvenation. And thanks to the presence of a complex of vitamins buckwheat is added to the cosmetics for thehair and scalp.

Based on the foregoing we can make a conclusion that buckwheat is one of those crops that can be subjected to complex processing.

Blueberry leaves, as well as buckwheat straw is not a target product, that's why presently in our country is not used. But scientific medicine has long shown interest in the blueberry fruit as the source of a whole complex of BAS which has a wide range of therapeutic and prophylactic properties. The high contain of BAS causes antioxidant, antidiabetic, anti-inflammatory, antiviral, anti-scorching, tonic, antipyretic, vasoprotective action, improves the rheological properties of blood, contributing to the strengthening of the walls of blood vessels, and also allows to inhibit the growth of tumors [5].

Blueberry has found wide application in different branches of a modern human life: as dyes, for tanning skin, in the food and pharmaceutical industries, blueberry fruit and leaves are used in cosmetology.

Blueberry fruit contain vitamins B1, B2, PP, E, C. Phosphorus, magnesium, sodium are micronutrients which make up blueberry. Of particular importance are the phenolic compounds present in fruit. These are physiologically active substances that strengthen the capillaries and retain ascorbic acid in organism. Almost all substances contained in fruit, are also in leaves of a plant. Protects hair from UV-rays and photo damages, improves metabolic processes in scalp.

The aim of the work was to study the possibility of using extracts of buckwheat and blueberry, obtained on the basis of previously unused production wastes, as a potential source of raw material for the development of a new herbal shampoo.

The composition of shampoo includes a great amount of main components: surface active agents (SAA); stabilizing, overheating, emollients; fragrances, solvents, plasticizers and others. Besides the main components to increase dermatological softness and achieve new functional properties of shampoo in their composition they introduce BAS and special additives. They are used in the form of tinctures, extracts, essences and oils. Compounds with BAS can refresh, soften and tone up the surface of the hair and scalp, help to improve its blood supply and regeneration, strengthen hair and stimulate their growth. To normalize the condition of scalp extracts of thyme, sage, marjoram, rosemary, ginseng, seaweed, meadow chamomile, lemon-balm, etc. are used. Bees royal jelly improves shine and combing hair, bactericidal, anti-handruff effects have extracts of propolis and essential oils.

To develop new herbal shampoo we obtained tinctures of blueberry leaves, blueberry fruit and buckwheat leaves. Tinctures were a clear colored liquid aqueous, were obtained without heating and removal of the extractant.

As is known the effectiveness of introducing the extract to cosmetic compositions depends on the effectiveness of the extract itself, its manufacturability (solubility and proportioning), stability at different pH and temperature, compatibility with other components of a system. That's why we studied the influence of plant tinctures on the characteristics of shampoo (foaming ability/foam number, foam stability).

At the first step of the study we explored indexes of anionic SAA which used an aqueous solution of sodium laureth sulfate. It was determined that optimal concentration of SAA that provides foaming properties on the level of requirements for hygienic detergents is 0.02%.

Next, we studied influence of different tinctures on characteristic indicators of shampoo. Samples of solutions with extracts containing 0.02% anionic SAA and from 10 to 60% of tinctures of blueberry fruit, blueberry leaves, buckwheat leaves were obtained. Samples of tinctures of blueberry fruit had a color from light pink to crimson due to the content of specific pigments in the composition of fruit – anthocyanins. Samples of tinctures of blueberry leaves had a pale yellow color due to the content of specific pigments in the composition of leaves – carotenoids. Samples of tinctures of buckwheat leaves had a pale yellow color which is also due to the content of carotenoids.Physical and chemical parameters of samples were identified.

Based on the results obtained in the course of the study a technological scheme of production herbal shampoo on the basis of all the above-described tinctures of vegetable raw materials was developed. Thus the possibility of using plant waste to create target product was clearly demonstrated.

References

1. Effects of vitamin E deficiency on fatigue and muscle contractile properties / J. Coombes [et al] // EurJApplPhysiol. –2002. – N 87. P. 272–277.

2. Kaur Ch. Antioxidant activity and total phenolic content of some Asian vegetables / Ch. Kaur, H.C. Kapoor// Intern. Journ.FoodSci. Techn. – 2002. – V. 37. N 2. – P. 153–161.

3. Renewable sources of chemical raw materials: complex processing of waste products of rice and buckwheat production / V.I. Sergienko [et al.] // J. of the Rus. Chem. Soc.D.I. Mendeleev. – 2004. N 3.–P. 116–124.

4. Loskutova, E.N. Scientific and informational support for the study of the composition of buckwheat production waste to substantiate the possibility of obtaining valuable products // Proceedings of the VI International Student e-Scientific Conference "Student Scientific Forum" http://www.scienceforum.ru/2014/2/7027 (date: 22.05 .2018).

5. Mukhametova, S.V. Parameters of fruiting and the content of flavonoids and ascorbic acid in the fruits of blueberry (*Vaccinium*) / S.V. Mukhametova, E.A. Skochilova, D.V. Protasov // Chemistry of plant materials. – 2017. –N3. –P. 113–121.