TECHNOLOGY REGYMES OF DISTILLATION PLANTS AS PROCESS CORIANDER

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Abstract: A comparative analysis of the regime parameters used in distilleries processing coriander in Russia and Bulgaria. Calculated specific consumption of steam and cooling water relative to feedstock for periodic equipment used in Bulgaria in a different capacity of the distillation apparatus and to D: H (1:1 and 1:2).
Keywords: distilling oil from fruits of coriander, distillation

INTRODUCTION:

Essential oil plants, and consequently essential oils have long been a man and used for medicinal purposes and as a flavoring [5, 10, 13].

For the production of essential oils are used in Russia approximately 40 species of aromatic materials as one of them it is a leading manufacturer such as coriander oil - 90% and Sage - 75-80% of total oil production [8, 13].

Coriander is an annual herb of the family *Apiaceae*. Essential oil is contained in all parts of the plant, but for industrial processing is obtained by steam distillation of ripe fruits of coriander [5, 6, and 9]. In them it is 0,2 to 2,2% depending on the origin, varieties and cultivars. For example, coriander from Morocco 0,2 to 0,6% essential oil from Argentina from 0.3 to 0.8%, Russia 0.8 to 2.2% [6].

Essential oil is used in perfumery or isolation linalol, which is a raw material for obtaining many flavoring substances. Oil is used in aromatherapy massage, baths and inhalations [6].

In [11] is determined the energy efficiency of distillation processes for color and leaf material processed in Bulgaria. Technological regimes are presented for processing color of roses (water-steam distillation), lavender petals, pine needles and grass, geranium (steam distillation) with a volume of the distillation apparatus 5 m^3. For processed commodities is fixed cost of steam and cooling water using 2 and 4 pieces distillery distilling apparatus in one cycle. It is determined the specific heat consumption i.e. proportion of the use of steam compared to the amount of raw material required for the cycle: a pink color – 2, 3; lavender petals – 1,8; pine needles – 1,2 grass and geranium – 2,8. It is estimated proportion of the cost of cooling water used in condenser-cooler to the quantity of processed raw material needed to cycle: a pink – 1,3; lavender petals – 0,795; pine needles – 0,788 and geranium grass – 1,325 [11].

Akteryan [2] is analyzed the energy efficiency of distillery processing of pink, lavender inflorescences and coniferous doing, holding the distillation apparatus 5 m^3. The author states: specific fuel glowing vapor (kg steam / kg raw material), heat distillation (MJ heat / kg raw material) and the cost of cooling water in condenser-cooler (kg water / kg raw material).

In the processing of raw materials essential oil in certain technological regimes are differences, due to the type of distillation apparatus - periodic and continuously operating,

the type of distillation (water-steam and steam), but also the technological parameters of the distillation process (speed, temperature distillate and duration of the process).

In [12] is presented the energy efficiency of distilleries processing muskatna Sage in Bulgaria and Russia. It is determined the specific heat consumption and total cost of steam for moving, periodic and continuous operating units. On the base of the comparison made is determined that it is more appropriate use of continuously operating apparatus in comparison with others. But market conditions in Bulgaria it is appropriate to use mobile and stationary devices periodically.

There are no data representing comparisons of different technological regimes used for processing fruit of coriander in Bulgaria and Russia.

THE PURPOSE

The purpose of this paper is to compare the modes of processing of coriander in periodic and continuous operating apparatuses at distillery used in Russia and Bulgaria.

In Bulgaria, the extraction of essential oil used fruit of coriander with the following procedure: distillation is carried out periodically in active devices, such as fruits intact or pre-ground [5]. In practice, with a view to better utilization of raw materials in a market economy is now appropriate to use distillation apparatus with a smaller capacity (1 and 2 m^3) than traditional (5 m^3).

To extract the essential oil of coriander in Russia in 1952-1953 years was used periodic sets [9]. Such devices are inexpensive performance and had a relatively large volume (2-4 m^3 - for devices without stirring the raw material and 6 m^3 for apparatus with a stirrer) high cost of steam, water and labor for their operation [1, 8].

Following development Aleksievi eterichnoekstraktsionen plant design is available continuously operating apparatus for processing ITR coriander consisting of a vertical cylindrical tank set (column) with a volume about 10 m^3 [9].

Subsequently it was proposed and implemented in industry more advanced continuously operating apparatus for obtaining essential oil from grain raw materials - and Ponomarenko Pokolenko. The unit is a separate column with a height of about 10 m, diameter 2 m, the unit volume is 29 m^3, and the working volume 21,3 m^3 [8, 9].

For small and medium enterprises with different forms of ownership arises an urgent need to create no less-and emki metoloemki a universal input apparatus productivity 1-2 t / h. To this end, the possibility has been investigated for use in processing of fruits of coriander in one of the basic devices - NDT, which is used primarily for processing of color-grassy material by steam distillation method [7].

In 1968 [3] was proposed a method of processing grain aromatic raw materials, especially coriander in hot steam.

There are no data representing comparisons of different technological regimes used for processing fruit of coriander in Bulgaria and Russia.

MATERIALS AND METHODS:

Periodic distillation apparatus used for processing of fruits of coriander in Bulgaria has the following parameters: 1 m^3 in place around 300 kg of ground, speed of 8-10 % distillation, distillate temperature of 37-45 ^{0} C. The process for crushed fruit is 2,5-3 h. In the deep intermediate apparatus used grids [10].

For processing are received: - speed of distillation 10 % distillate temperature 41 ^{0} C and the duration of the 3 h.

In Russia, is mainly used continuously operating apparatus and Ponomarenko Pokolenko with the follow parameters:

Output of oil – 0,8221 percent; productivity of 1 m^3 of working volume of the unit - 480 kg/h; Oil content in distillate output – 0,0111%, electricity consumption per 1 kg of oil - 0,082 kWh; residence time raw material in the apparatus - 28-30 min [9]. During the processing of fruits of coriander in a continuously operating apparatus (NDT) defined the following optimal regimes for the work:-performance - 1,5 t/h; - fuel vapor - 0,55 t/h;-water consumption - 5 m^3/h; -Temperature of the distillate - 40 ^{0} C [7].

Table 1 Parameters of periodically operating machines for processing of fruits of coriander

Parameters	*Periodical operating distillation apparatuses*					
	Ratio D:H – 1:1			*Ratio D:H – 1: 2*		
	1м^3	*2м^3[4]*	*5 м^3*	*1м^3*	*2м^3*	*5 м^3*
	Bulgaria					
Productiveness, kg/h	*100*	*200*	*500*	*100*	*200*	*500*
Temperature of the distillate, ^{0} C	*41*	*41*	*41*	*41*	*41*	*41*
Consumption of steam, kg/h	*114,1*	*227,7*	*567,4*	*115,0*	*229,0*	*570,1*
Consumption of cooling water kg/h	*24,6*	*49,2*	*122,9*	*24,6*	*49,2*	*122,9*
Duration of distillation,min.	*180*	*180*	*180*	*180*	*180*	*180*
Specific consumption of cooling water kg water/kg raw material	*0,246*	*0,246*	*0,246*	*0,246*	*0,246*	*0,246*
Specific consumption of steam, kg steam/kg oil	*76,1*	*75,9*	*75,7*	*76,7*	*76,4*	*76,0*

The data presented in Table 1 shows that the specific consumption of steam relative to the resulting oil is slightly higher when using periodic distillation apparatus with respect to D: H = 1:2. This is probably due to the large volume of the distillation apparatus. Impressed significantly lower specific consumption of steam in the apparatus with a larger volume - 5 m^3 in comparison with others, the lowest in terms of equipment using D: H = 1:1, i.e. more appropriate to use devices with greater capacity than smaller. Cooling water consumption increased in proportion to the increase of the distillation apparatus, set at the same temperature of the distillate. Specific consumption of cooling water is constant, from which it can judge that it is more appropriate to use the distillation apparatus with a larger volume.

Table 2 Parameters of a continuously operating apparatus for processing fruit of coriander

Indices	*Continuously operating apparatus*		
	Pomarenko and Pokolenko [8,9]	*NDT [7]*	*Steaming apparatus [3]*
Productiveness, kg/h	*10 000*	*1500*	*57*
Temperature of the distillate, ^{0} C	*41*	*40*	-
Consumption of steam, kg/h	*492,61*	*550*	*80*
Consumption of cooling water kg/h	*122,92*	*500*	-
Duration of distillation,min.	*28-30*	-	-
Specific consumption of heat, kg steam/kg raw material	*0,61*	*0,37*	*1,4*
Specific consumption of steam, kg steam/kg oil	*41,5*	-	-

Table 2 presents the results from the processing of coriander in continuously operating apparatus (Pomarenko-Pokolenko, NDT and Steaming apparatus), as shown by the data displayed is the lowest specific consumption of heat in NDT apparatus compared with the other two. This apparatus is used primarily for processing of color-grassy material, but attempts have been made for the processing of grain and raw material mainly coriander. In Fig. 1 provides a diagram reflecting the specific heat consumption (kg steam / kg raw material) for periodic distillation apparatus with varying capacity of the unit and to D: H. As seen from the figure the greater the specific consumption of heat for distillation apparatus to D: H = 1:2 compared to typically used in practice apparatus with respect D: H = 1:1, which is due to the larger volume of the apparatus. Impressed that the growth of the distillation apparatus specific steam consumption decreases, therefore, is much more appropriate use of equipment with greater capacity.

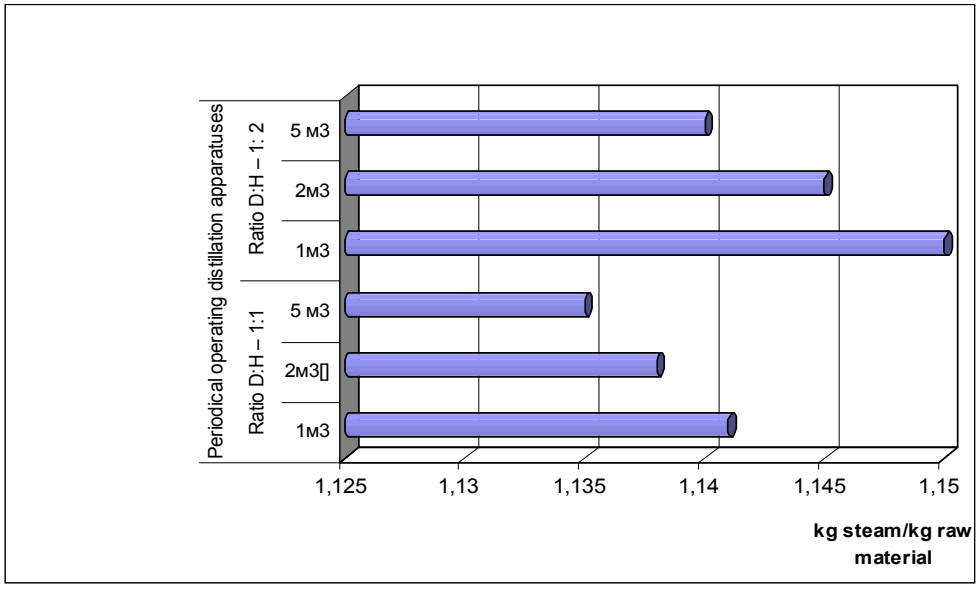

Fig. a Specific consumption of heat in the volume of the distillation apparatus

CONCLUSION:

On the based of the data for different process modes for processing fruit of coriander can say that it is appropriate use of continuously operating apparatus (the apparatus is performing NDT - primarily used for treatment of grass-colored material) in compared to regular force. If necessary, the use of periodic distillation apparatus is better to use machines with greater volume and with a D: H = 1:1, as practiced now in Bulgaria.

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