EFFECT OF ETHANOL PLANT EXTRACTS ON *STAPHYLOCOCCUS EPIDERMIDIS*, *STAPHYLOCOCCUS AUREUS*

V. V. Zazharskyi, P. O. Davydenko, O. M. Kulishenko, I. V. Borovik, V. V. Brygadyrenko

1 Dnipro State Agrarian and Economic University, Dnipro, Ukraine
2 Dnipropetrovsk Regional State Laboratory of the State Service of Ukraine for Food Safety and Consumer Protection, Dnipro, Ukraine
3 Oles Honchar Dnipro National University, Dnipro, Ukraine

The emergence of multiresistant strains of *Staphylococcus epidermidis*, *Staphylococcus aureus* that are difficult to antibiotics and cause severe lesions of soft tissues, sepsis, and complicated surgical pathology are recognized as the one of problems of current infectious diseases of animals and humans. One of challenges in pharmacognosy is the search for alternative sources of antibacterial substances with an exhaustive resource of antibiotics of fungal origin. The use of raw medicinal plants is quite promising in this regard. The tendency of scientific research of recent decade reveals a promising range of plants of a number of families, which typically contents certain active substances (phytoncides, saponins, alkaloids, glycosides, tannins, essential oils etc.).

The goal of the work was to establish the antibacterial effect of plant infusions on reference cryogenic strains of *Staphylococcus epidermidis*, *Staphylococcus aureus* in vitro.

Herbal material of 50 species (seeds, grass, shoots, leaves, compound fruit, peel) obtained at different periods of the growing season was used for investigation. The material was classified, dried, and grounded. Samples of 1 g were poured with 5 cm$^3$ of 96 % ethanol and were kept it over three weeks in a dry cold place. The obtained alcohol infusion was filtered with sterile multi-layer gauze disc filters. Before the discs were put on the surface of agar with inoculation of the corresponding culture, they were dried in a sterile laminar box under ultraviolet rays. Antibacterial activity of various tinctures was determined by the disk diffusion method in agar with the measurement of the diameter of the growth suppression zone of the culture using a template ruler.

Concerning the above mentioned point, herein, we report the results of the use of tinctures *Staphylococcus epidermidis*, *Staphylococcus aureus* in vitro. Obtained data has been systematized, summarized and evaluated.

The paper presents the results of the effectiveness of phytopreparations on *Staphylococcus epidermidis*, *Staphylococcus aureus* in vitro. The antibacterial effect of plant tinctures of *Cephalotaxus harringtonia*, *Hedera helix*, *Geranium sanguineum* on cryogenic strains *Staphylococcus epidermidis*, *Staphylococcus aureus*. We consider it possible to recommend the investigated extracts of *Cephalotaxus harringtonia*, *Hedera helix*, *Geranium sanguineum* for further research in the fight against polyresistant strains of the above-mentioned microorganisms.

The obtained results give grounds to recommend herbal tinctures to combat multi-resistant strains of *Staphylococcus epidermidis*, *Staphylococcus aureus*.

**Keywords:** ANTIBACTERIAL ACTIVITY, TINCTURE, STAPHYLOCOCCUS EPIDERMIDIS, STAPHYLOCOCCUS AUREUS.

One of the problems of modern veterinary medicine is the antibiotic resistance of *Staphylococcus epidermidis*, *Staphylococcus aureus*, which greatly complicates the prevention and control of these infections and reduces the therapeutic efficacy of existing antibacterial and
antiparasitic agents (Zazharska et al., 2018; Zazharskyi et al., 2018; Boyko & Brygadyrenko, 2016; Ali et al., 2017; Semeniuc et al., 2017).

According to Dancer et al. (2014), *Staphylococcus aureus*, including methicillin-resistant strains, is a major cause of nosocomial infections. The rise of specific strains in hospitalized patients and even in the community calls for a better understanding of prevention and control measures.

Research results Karam et al. (2017), suggest that 80% of *S. aureus* and 80% of *S. epidrmidis* isolates developed Methicillin resistance. The findings of the current work have shown that most of the methicillin-resistant *S. aureus* (MRSA) and methicillin-resistant *S. epidermidis* (MRSE) formed a weak biofilm. Results showed that the number of biofilm cells strongly reduced to undetectable limits in the presence of gentamicin.

Vandecandelaere et al. (2017) found that *S. epidermidis* ET-024 genes encoding resistance to oxacillin, erythromycin and tobramycin were upregulated in dual species biofilms and increased resistance was subsequently confirmed. This indicates that both species in dual species biofilms of *S. epidermidis* and *S. aureus* influence each other's behavior, but additional studies are required to clarify the exact mechanism(s) involved.

Kiranasari et al. (2018) have established that extract of Syzgium aromaticum, *Piper betle* and *Aleurites moluccana* were show anti bacterial activity against MRSA (Methicillin-resistant *Staphylococcus aureus*), *Staphylococcus aureus* and *Staphylococcus epidermidis*.

Kırmasıoğlu (2017) found the rate of methicillin resistance of biofilm producer *Staphylococcus* strains are higher than non-biofilm producer *Staphylococcus* strains, and MRSE strains were more related with biofilm production (80%, 56/70) than MSSE strains (64%, 138/217) significantly.

In studies McFadden (2016) explored the role Staphylococcus aureus autolysins play in biofilm formation, pathogenesis and resistance to both cell wall targeting and protein synthesis-inhibiting antibiotics. Using a variety of mutant strains in the USA300 background lacking genes encoding autolysins, sortases, histidine-kinase signaling systems, as well as regulatory proteins, the role of these genes in MRSA could be elucidated. The results suggest a variety of negative phenotypes that correlate with the loss of these key autolysins and regulatory genes. Decreases in biofilm formation, antibiotic resistance, and pathogenesis were seen in many of the mutants. This indicates a possible relationship between autolysins and many of the characteristics of pathogenesis in *Staphylococcus aureus*.

Anitua et al. (2012) got the potential antimicrobial effects of a product (plasma rich in growth factors; PRGF®-Endoret®) against both methicillin-sensitive and methicillin-resistant *Staphylococcus aureus* and *Staphylococcus epidermidis*. The microbiological activity of PRGF-Endoret against both staphylococcal strains was performed by counting the number of the surviving bacterial colonies after incubation at 0, 4 and 8 h with the different formulations.

Antibacterial potency with change of volume was increased in propotion to increase volume and increased on 6 days, but bacteria was increased. Antibacterial potency of Tangpo-san on *S. epidermidis* wasn't appeared continuous and antibacterial potency of Tangpo-san on cultivation of *S. aureus* showed continuous, but on cultivation of *S. epidermidis* was not showed continuous (Seo, 2007).

The purpose of this article – is to establish the antibacterial effect of in vitro herbal infusions on reference strains *Staphylococcus epidermidis*, *Staphylococcus aureus*.

**Material and methods.** 50 species of plant raw materials (seeds, grass, shoots, leaves, breeding, flax, fruit bodies, skin) of different vegetation periods were harvested in the Dnipropetrovsk botanical garden and the recreational zone of the city of Dnipro

The collected raw materials were sorted and dried in a drying cabinet ML-309 (Poland) at a temperature of 60 °C for 5-6 days. Subsequently, the raw material was placed in a grain mill grain laboratory LSMK and crushed to a particle size of 0.5-1.0 mm. The resulting vegetable raw material was packed in disposable polyethylene bags with locks and marketed with stickers. 1 g of appropriate
crumbled raw material was weighed using laboratory electron analytical grade ESJ-200-4 (USA) and placed in sterile vials of 10 cm³ and poured into 5 cm³ of 96% ethanol with the appropriate labeling of the vials. Alcoholic tinctures in a ratio of 1:5 were kept for three weeks by infusion in a dark cool place. After holding, the tincture was filtered through sterile multi-layer gauze filters in sterile vials, which were placed in 50 sterile disks of filter paper 6 mm in diameter, which were kept in appropriate versions of tinctures for 10 days. Before placing the disks on the agar surface with the sowing of the corresponding culture, they were dried in a sterile laminar box (BMB-II-Laminar-C-1,2 CYTOS (Germany) under ultraviolet rays for 30 minutes.

The antibacterial activity of various plant infusions was determined by the method of disk diffusion in agar. From the daily culture of reference cryogenic strains of Staphylococcus epidermidis, Staphylococcus aureus was prepared according to the standard of turbidity of a bacterial suspension of 0.5 unit density McFarland 1.5 × 10⁸ CFUs (colony forming units), which was determined using densitometry Densimeter II. The obtained charge was transplanted onto a Himedia agar with subsequent cultivation in a thermostat TSO-80/1 (Russia) for 24 hours at 37 °C. On top of the seedings, discs impregnated with appropriate plant infusions were placed on the six-wheel drive in time, as a positive control, placed disks with antibiotics (1 disk contains 30 μg tetracycline, 5 μg ciprofloxacin, 15 μg azithromycin).

A day later, the diameter of the growth inhibition zone (GIZ) of the culture was measured using a template ruler to measure the size of the microorganism growth retardation zones (Antibiotic Zone Scale-C, model PW297, India).

Results and discussion. The results of the influence of ethanol extracts on the growth of Staphylococcus epidermidis are given in Table 1.

We determined the moderate sensitivity of the microorganisms Staphylococcus epidermidis to Vitex negundo, Maclura pomifera, Rhus typhina, Koebreteria paniculata, Cephalotaxus harringtonia, Saburumim an angioides, Aristolochia manshurica, which was equal to the control parameters azithromycin. Intermediate sensitivity was detected in Leptopus chinensis (P <0.05), Geranium sanguineum (P <0.05), Celastrus scandens, Clematis flammula (P <0.05), Chimonanthus praecox (P <0.05), Rhus trilobata triloboida), GIZ within 14-19 mm. The high sensitivity of the experimental strain was detected by Hedera helix and Mahonia aquifolium spp. (within 21-27 mm). In addition, the GIZ to Hedera helix is higher than control (tetracycline and azithromycin) at 2.2 and 11.6 mm respectively. Mahonia aquifolium spp. has GIZ above azithromycin 6.8 mm (P <0.05).

Analyzing the effectiveness of the effect of the experimental drugs on Staphylococcus aureus (Table 2), we determined the fluctuations of the growth inhibition zone of more than 10 mm with the use of Juniperus sabina, Styphnolobium japonicum, Cotinus coggyria, Ginkgo biloba, Quercus castaneifolia, Ptelea trifoliata, Toxicodendron orientale (GIZ 10-13 mm), which in 2 and more times below control (tetracycline, ciprofloxacin, azithromycin). Intermediate sensitivity is defined for Clematis flammula, Celastrus scandens, Rhus trilobata (triloboida), which is 4-10 mm insignificantly below control.

We detected a highly sensitive antibacterial effect on the Staphylococcus aureus strain under the action of Cephalotaxus harringtonia, Hedera helix, Geranium sanguineum, and GIZ ranged from 21 to 28 mm. Moreover, if the effect of Cephalotaxus harringtonia at the control level (ciprofloxacin and azithromycin), then Hedera helix, Geranium sanguineum exceeded the control: by 2.1; 1.0 mm and 4.2; 1.0 mm respectively. The highest antibacterial effect is obtained from tetracycline (GIZ within 26-29 mm).
Table 1

Effect of ethanolic extracts on growth of Staphylococcus epidermidis, (M±m), n=12

| №  | The name of the plant                  | Growth inhibition zone, mm | Reference, mm |
|----|--------------------------------------|----------------------------|---------------|
| 1  | Vitex negundo                        | 10,5±2,13                  | 26,5±3,44     |
| 2  | Genista tanacitea                    | 0                         | 28,7±3,56     |
| 3  | Juniperus sabina                      | 24,6±2,45                  | 20,7±3,25     |
| 4  | Leptopus chinensis                   | 18,7±1,78*                | 24,9±2,45     |
| 5  | Chamaecyparis lawsoniana             | 0                         | 25,4±3,12     |
| 6  | Pseudotsuga menziesii                | 0                         | 27,1±2,67     |
| 7  | Styphnolobium japonicum              | 0                         | 28,2±3,12     |
| 8  | Artemisia absinthium                 | 2,3±0,67                  | 24,1±1,45     |
| 9  | Maclura pomifera                     | 10,9±1,12                 | 23,6±2,34     |
| 10 | Koebreteria paniculata               | 11,3±1,45                 | 28,5±3,42     |
| 11 | Phellodendron amurense               | 2,6±0,45                  | 24,7±2,56     |
| 12 | Vitex agnus castus                   | 4,4±0,78                  | 26,4±2,58     |
| 13 | Rhus typhina                         | 10,7±1,22                 | 28,5±4,32     |
| 14 | Aralia elata                         | 0                         | 24,4±2,43     |
| 15 | Cotinus coggygria                    | 11,9±1,54                 | 26,8±2,54     |
| 16 | Cephalotaxus harringtonia            | 13,4±1,45                 | 27,8±3,17     |
| 17 | Polygonatum multiflorum              | 8,6±1,34                  | 25,7±3,45     |
| 18 | Dictamnus alba                       | 8,9±1,56                  | 24,6±2,56     |
| 19 | Amygdalus communis (prenculi)        | 8,5±2,13                  | 28,9±3,54     |
| 20 | Hederia helix                        | 26,3±2,15                 | 24,1±3,12     |
| 21 | Eucommia ulmoides                    | 0                         | 26,7±3,22     |
| 22 | Geranium sanguineum                  | 18,4±1,45*                | 27,4±2,76     |
| 23 | Kahleopa bodin-termia                | 8,3±1,13                  | 26,9±2,78     |
| 24 | Salvia officinalis                   | 6,2±0,88                  | 26,4±2,55     |
| 25 | Chimonanthus praecox                 | 18,7±1,84*                | 26,5±3,67     |
| 26 | Nepeta mussini                       | 0                         | 24,8±2,56     |
| 27 | Tamarix elongata                     | 8,7±1,77                  | 23,8±2,78     |
| 28 | Catalpa fargesii                     | 0                         | 25,7±3,32     |
| 29 | Wistaria sinensis                    | 0                         | 24,9±2,76     |
| 30 | Ailanthus altissima                  | 1,2±0,22                  | 26,5±2,77     |
| 31 | Saburumum angiroides                 | 10,3±1,57                 | 25,2±2,97     |
| 32 | Securigera varia                     | 0                         | 27,2±3,42     |
| 33 | Potentusis tricodiata                | 0                         | 26,7±2,44     |
| 34 | Magnolia kobus                       | 0                         | 24,8±1,89     |
| 35 | Berberis vulgaris                    | 0                         | 24,4±2,14     |
| 36 | Clematis flammula                    | 18,7±1,77*                | 26,6±2,56     |
| 37 | Aristolochia mansurica               | 12,8±2,44                 | 24,1±3,34     |
| 38 | caramel sceandis                     | 15,3±1,78                 | 27,8±3,21     |
| 39 | Mahonia aquifolium spp.              | 21,6±2,34*                | 23,6±1,78     |
| 40 | Quercus petrariberica                | 0                         | 24,5±2,34     |
| 41 | Ginkgo biloba                        | 8,7±0,76                  | 28,7±3,31     |
| 42 | Colchicum autumnale                  | 8,3±0,88                  | 23,8±2,44     |
| 43 | Quercus castaneifolia                | 8,9±1,13                  | 26,3±2,43     |
| 44 | Rhus trilobata (triloboida)          | 14,4±0,78                 | 25,8±2,49     |
| 45 | Prunus laurocerasus                  | 2,3±0,76                  | 24,9±2,12     |
| 46 | Ptelea trifoliata                    | 4,6±0,87                  | 23,6±2,33     |
| 47 | Toxicodendron orientale              | 0                         | 26,7±3,54     |
| 48 | Liriodendron talipiferro             | 0                         | 27,6±2,76     |
| 49 | Campsis radicans                     | 0                         | 28,7±3,45     |
| 50 | Pteridium aquilinum                  | 0                         | 25,5±2,15     |

* P<0,05

Reference

Table 1
### Table 2

**Effect of ethanolic extracts on growth of Staphylococcus aureus, (M±m), n=12**

| №  | The name of the plant       | Growth inhibition zone, mm | Reference, mm |
|----|-----------------------------|----------------------------|---------------|
|    |                             | Tetracycline               | Ciprofloxacin | Azithromycin |
| 1  | Vitex negundo               | 27,4±2,19                  | 20,9±2,98     | 24,1±2,54    |
| 2  | Genista tanacetica          | 25,7±2,98                  | 22,8±2,97     | 23,3±2,39    |
| 3  | Juniperus sabina            | 24,6±2,67                  | 21,7±2,68     | 21,6±2,45    |
| 4  | Leptopus chinensis          | 27,9±2,66                  | 19,4±2,11     | 25,1±1,77    |
| 5  | Chamaecyparis lawsoniana    | 28,4±2,14                  | 18,9±2,15     | 23,2±2,39    |
| 6  | Pseudotsuga menziesii       | 29,1±2,66                  | 19,8±2,93     | 24,1±2,48    |
| 7  | Styphnolobium japonicum     | 25,2±2,76                  | 20,6±2,32     | 22,6±2,34    |
| 8  | Artemisia absinthium        | 26,1±2,69                  | 20,9±2,68     | 20,9±2,25    |
| 9  | Maclura pomifera            | 27,6±2,19                  | 19,7±2,67     | 20,9±1,88    |
| 10 | Koebreteria paniculata      | 26,5±2,33                  | 21,8±2,76     | 23,1±2,35    |
| 11 | Phelloendron amurense       | 26,7±2,79                  | 21,6±2,15     | 25,6±2,32    |
| 12 | Vitex agnus castus         | 25,4±2,61                  | 19,3±2,04     | 24,1±2,27    |
| 13 | Rhus typhina                | 24,5±2,36                  | 22,9±2,13     | 22,5±2,78    |
| 14 | Aralia elata                | 29,4±2,16                  | 19,2±2,79     | 24,3±2,77    |
| 15 | Cotinus coggygria           | 29,8±2,11                  | 18,7±2,78     | 25,3±2,67    |
| 16 | Cephalotaxus harringtonia   | 28,8±2,33                  | 21,7±2,16     | 21,8±2,56    |
| 17 | Polygonatum multiflorum     | 27,7±2,79                  | 20,9±2,36     | 24,9±2,78    |
| 18 | Dictamnus alba              | 26,6±2,51                  | 21,8±2,52     | 25,8±2,67    |
| 19 | Amygdalus communis (prensculi) | 25,9±2,61                  | 20,6±2,21     | 22,6±2,67    |
| 20 | Heder a helix               | 26,1±2,21                  | 21,4±2,41     | 22,7±2,21    |
| 21 | Eucommia ulmoides           | 27,7±2,51                  | 22,8±2,09     | 24,6±2,67    |
| 22 | Geranium sanguineum         | 29,4±2,57                  | 21,7±2,12     | 24,4±2,78    |
| 23 | Kalochip bodmeri neum       | 29,9±2,61                  | 19,5±2,27     | 25,9±3,41    |
| 24 | Salvia officinalis          | 28,4±2,44                  | 18,8±2,98     | 22,4±2,13    |
| 25 | Chimonanthus praecox        | 27,5±2,61                  | 19,4±2,29     | 23,5±2,21    |
| 26 | Nepeta mussinii             | 26,8±2,88                  | 20,5±2,89     | 22,5±2,19    |
| 27 | Tamarix elongata            | 27,8±2,87                  | 21,9±2,22     | 25,6±2,31    |
| 28 | Catalpa fargesii            | 26,7±2,46                  | 20,5±2,78     | 22,4±2,11    |
| 29 | Wisteria sinensis           | 27,9±2,12                  | 21,7±2,51     | 23,8±1,97    |
| 30 | Alianthus altissima         | 28,5±2,41                  | 19,7±2,32     | 22,1±2,14    |
| 31 | Saburumum anagroides        | 27,2±2,78                  | 18,2±2,76     | 23,8±2,41    |
| 32 | Securigera varia            | 26,2±2,69                  | 19,8±2,32     | 22,4±2,71    |
| 33 | Potensisus tricopidata      | 28,7±2,54                  | 20,8±2,21     | 24,5±2,31    |
| 34 | Magnolia kobus              | 26,8±2,61                  | 20,5±2,41     | 24,6±2,13    |
| 35 | Berberis vulgaris           | 27,4±2,32                  | 19,7±2,62     | 22,4±2,31    |
| 36 | Clemanthius flammula        | 25,6±2,23                  | 19,4±2,77     | 24,8±2,74    |
| 37 | Aristolochia mansurica      | 27,1±2,77                  | 18,3±2,11     | 24,4±2,31    |
| 38 | Celastrus scandens          | 28,8±2,98                  | 21,4±2,41     | 24,8±2,53    |
| 39 | Mahonia aquifolium spp.     | 26,6±2,41                  | 22,6±2,12     | 22,6±3,1    |
| 40 | Quercus petraebireca        | 26,5±2,67                  | 22,5±2,03     | 23,2±2,59    |
| 41 | Ginkgo biloba               | 25,7±2,76                  | 21,3±2,51     | 20,9±2,46    |
| 42 | Colchicum autumnale         | 27,8±2,89                  | 18,8±2,78     | 22,4±2,77    |
| 43 | Quercus castaneifolia       | 27,3±2,71                  | 21,5±2,61     | 20,6±2,77    |
| 44 | Rhus trilobata (triloboida) | 26,8±2,24                  | 19,4±2,76     | 22,8±2,11    |
| 45 | Prunus laurocerasus         | 27,9±2,76                  | 20,1±2,78     | 22,6±2,75    |
| 46 | Ptelea trifoliata           | 28,6±2,59                  | 21,2±2,21     | 23,3±2,14    |
| 47 | Toxicodendron orientale     | 26,7±2,76                  | 19,5±2,08     | 21,8±2,31    |
| 48 | Liriodendron talipfero      | 29,6±2,34                  | 18,7±2,64     | 21,5±2,11    |
| 49 | Campsis radicans            | 27,7±2,21                  | 19,6±2,42     | 22,7±2,41    |
| 50 | Pteridium aquilinum         | 27,2±2,44                  | 21,4±2,21     | 21,9±1,56    |

* P<0.05
CONCLUSION

In vitro experiment revealed a positive antibacterial effect from the use of extracts of Cephalotaxus harringtonia, Hedera helix, Geranium sanguineum on cryogenic strains Staphylococcus epidermidis, Staphylococcus aureus. We consider it possible to recommend the investigated extracts of Cephalotaxus harringtonia, Hedera helix, Geranium sanguineum for further research in the fight against polyresistant strains of the above-mentioned microorganisms.

Conflicts of interest. The authors declare that there is no conflict of interest. The authors alone are responsible for the content of the paper.
Hedera helix, Geranium sanguineum на криогенные штаммы Staphylococcus epidermidis, Staphylococcus aureus. Мы вважаємо за можливе рекомендувати досліджені екстракти Головчастого тису Гаррингтону, Плюща звичайного, Герань криваво-червону для подальших досліджень у боротьбі з полірезистентними штамами Staphylococcus epidermidis, Staphylococcus aureus.

Отримані результати дають підстави рекомендувати трав’яні настоянки для боротьби з мультирезистентними штамами Staphylococcus epidermidis, Staphylococcus aureus.

Ключові слова: АНТИБАКТЕРІАЛЬНА АКТИВНІСТЬ, ЕТАНОЛЬНІ ЕКСТРАКТИ, STAPHYLOCOCCUS EPIDERMIDIS, STAPHYLOCOCCUS AUREUS.

ВЛИЯНИЕ ЭТАНОЛЬНЫХ РАСТИТЕЛЬНЫХ ЭКСТРАКТОВ НА STAPHYLOCOCCUS EPIDERMIDIS, STAPHYLOCOCCUS AUREUS

В. В. Зажарский1, П. А. Давыденко1, О. Н. Кулишенко1, И. В. Боровик2, В. В. Бригадиренко3

1Днепровский государственный аграрно-экономический университет ул. Сергея Ефремова, 25, г. Днепр, 49600, Украина
2Днепропетровская региональная государственная лаборатория Государственной службы пр. Александра Поля, 48, г. Днепр, 49054, Украина
3Днепровский национальный университет имени Олеся Гончара пр. Гагарина, 72, г. Днепр, 49000, Украина

АННОТАЦИЯ

В последнее время все чаще появляются сообщения о потенциальной возможности поиска эффективных антибактериальных веществ в растительных экстрактах в связи с распространением полирезистентных к антибиотикам бактериальных штаммов, которые трудно поддаются лечению.

Одной из проблем в фармакогнозии является поиск альтернативных источников антибактериальных веществ с исчерпывающим ресурсом антибиотиков грибного происхождения. Использование этанольных экстрактов лекарственных растений является перспективным в этом отношении. Тенденция научных исследований последнего десятилетия раскрывает многообещающий ассортимент растений ряда семей, которые обычно содержат определенные активные вещества (фитонциды, сапонины, алкалоиды, гликозиды, дубильные вещества, эфирные масла и т.п.).

Целью работы было установление антибактериального эффекта этанольных экстрактов растений на штаммы Staphylococcus epidermidis, Staphylococcus aureus in vitro. Для исследования использовали растительный материал 50 видов (семена, трава, побеги, листья), полученные в разное время вегетационного периода. Материал был классифицирован и высушен. Образцы по 1 г выливали 5 см3 96 % этанола и выдерживали в течение трех недель в сухом холодном месте. Полученный спиртовой настой фильтровали стерильными многослойными марлевыми дисковыми фильтрами. Перед тем, как диски были помешаны на поверхность агара с инокуляцией соответствующей культуры, их сушили в стерильном ламинарном ящике под ультрафиолетовыми лучами. Антибактериальную активность различных настоев определяли методом дисковой диффузии в агаре с измерением диаметра зоны подавления роста культуры с использованием шаблона линейки. Полученные данные систематизированы, обобщены и оценены.

В статье представлены результаты эффективности фитопрепаратов на Staphylococcus epidermidis, Staphylococcus aureus in vitro. Антибактериальное действие растительных настоек Cephalotaxus harringtonia, Hedera helix, Geranium sanguineum на криогенные штаммы Staphylococcus epidermidis, Staphylococcus aureus. Мы считаем возможным рекомендовать исследованные экстракты Головчатотисса Харрингтона, Плюща обыкновенного, Герани кроваво-красной для
дальнейших исследований в борьбе с полирезистентными штаммами вышеупомянутых микроорганизмов.

Полученные результаты дают основания рекомендовать травяные настойки для борьбы с мультирезистентными штаммами Staphylococcus epidermidis, Staphylococcus aureus.

**Ключевые слова:** АНТИБАКТЕРИАЛЬНА АКТИВНОСТЬ, ЭТАНОЛЬНЫЕ ЭКСТРАКТЫ, STAPHYLOCOCCUS EPIDERMIDIS, STAPHYLOCOCCUS AUREUS.

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**Рецензент** – П. М. Склярев, д. вет. н., профессор кафедры хирургии и акушерства Дніпровського державного аграрно-економічного університету.