STUDY OF CHINESE HONEY LOCUST (GLEDITSIA SINENSIS) AND SHALLOT (ALLIUM ASCALONICUM L.) FOR INTEGRATE TRADITIONAL CHINESE MEDICINE INTO OTHER COUNTRIES' MEDICINE IN ORDER TO IMPROVE PUBLIC HEALTH

M. H. Shahrajabian1,8, W. Sun1,8, M. Khoshkharam2, H. Shen3, Q. Cheng1,4*
1Biotechnology Research Institute, Chinese Academy of Agricultural Sciences, Beijing, China
2Isfahan (Khorasgan) Branch, Islamic Azad University, Isfahan, Iran
3College of Life Sciences, Hebei Agricultural University, Baoding, Hebei, China; Global Alliance of HeBAU-CLS&HeQIS for BioAl-Manufacturing, Baoding, Hebei, China
*Corresponding email: chengqi@caas.cn
These authors contributed equally to this paper

Received: 1 June 2020; Accepted: 27 June 2020

Cite as: Shahrajabian, M.H., Sun, W., Khoshkharam, M., Shen, H., Cheng, Q. (2020). Study of Chinese honey locust (Gleditsia sinensis) and Shallot (Allium ascalonicum L.) for integrate traditional Chinese medicine into other countries’ medicine in order to improve public health. Labour Protection Problems in Ukraine, 36(2), 8-14.

The population health is an important component of the country development, since the working capacity and workers' safety in the workplace depends on their health status. Toxic substances that are used in the manufacturing process often cause allergies, inflammatory processes of the skin and internal organs, sometimes diabetes and cancer. To strengthen immunity and improve the health of workers, traditional Chinese medicine, which has achieved great success at present, can be recommended. The aim of this manuscript is review of health benefits and pharmaceutical impacts of Chinese honey locust and shallot. Literature search was conducted in Medline, Research Gate, Scopus, PubMed and Google Scholar Databases. The keywords were Chinese honeylocust, shallot, traditional Chinese medicine, Asian medicine and modern pharmaceutical Sciences. Gleditsia sinensis Lam. (G. sinensis) is a perennial arbour spread in most parts of the world, especially in China. It is a classical traditional Chinese medical herb. All relevant papers in the English language of researchers from different countries were collected. The most important benefits of shallots are high source of antioxidants, improve heart health, cancer prevention, and diabetes, anti-inflammatory, antimicrobrial, might help fight obesity, and help to prevent or treat allergies. The most important components of Gleditsia sinensis are triterpenoid saponins, triterpenes, flavonoids, alcaloids, phenolics, sterols, and their important derivatives are responsible for tremendous medicinal effects. It has been reported that Gleditsia sinensis Lam thorn (GST) possesses a wide spectrum of pharmacological activities such as antioxidant, anti-inflammatory, anti-microbial, anti-angiogenic and anti-tumor effects. Its fruit is antibacterial, antifungal, antioxidative, astringent, emetic, expectorant, haemostatic and stimulant. The seed is emetic, expectorant, decongestant and purgative, and its root bark is both anthelmintic and anti-tumour. The obtained findings suggest potential of Shallot and Chinese honey locust in both food and pharmaceutical industries. The demand for shallot products is increasing every year with increase population growth and food industries. More clinical studies may necessary to uncover the numerous substances and their effects in shallot that contribute to public health.

Keywords: population health; workers' strengthening immunity; Chinese honey locust; Shallot; traditional Chinese medicine.
1. Problem statement and analysis of the recent researches and publications.

The population health is an important component of the country development, since the working capacity and workers' safety in the workplace depends on their health status. Very often, the labor process is accompanied by a significant influence of harmful and dangerous factors at the workplace, such as noise, vibration, dust of toxic substances, etc. Toxic substances that are used in the manufacturing process often cause allergies, inflammatory processes of the skin and internal organs, sometimes diabetes and cancer. To strengthen immunity and improve the health of workers, traditional Chinese medicine, which has achieved great success at present, can be recommended. Not only natural products, but also traditional medicines have great importance [1–3]. Traditional medicine contains health practices, knowledge, approaches and beliefs incorporating plants, fruits and herbs based on both ancient and modern pharmaceutical science [4–7]. Traditional Asian and Chinese medicine play a significant role in sustainable food systems, it is also offers a notable approach to prevent diseases while making suitable usage of organic and herbal products [8–11].

The aim of this manuscript is review of health benefits and pharmaceutical impacts of Chinese honey locust and shallot.

2. Statement of the problem and its solution.

2.1. Materials and methods.

Literature search was conducted in Medline, Research Gate, Scopus, PubMed and Google Scholar Databases. The keywords were Chinese honey locust, shallot, traditional Chinese medicine, Asian medicine and modern pharmaceutical sciences.

2.2. Results and Discussion.

2.2.1. Chinese Honey Locust (Gleditsia sinensis).

It is reported that the fruit of G. sinensis consists of triterpenoids, oligosaccharides and flavonoids and it has been used as a traditional Chinese herbal medicine for the treatment of miscellaneous diseases like epilepsy and parasitic disease [12]. It is called Jo Gak Ja in Korea and also documented in the Chinese Pharmacopoeia as Zao Jiao Ci [13]. In different parts, it is called Da Zhao Jiao, Zhu Ya Zao, Zao Jia Zi, Zao Jia Ye, Zao Jiao Ci, and Zao Jia Gen Pi [14]. Gleditsiae sinensis fructus (Da Zhao Jiao), Gleditsiae fructus abnormalis (Zhu Ya Zao), and Gleditsiae spina (Zao Jiao Ci) are officially recorded in the Chinese Pharmacopeia [15]. Content of echinocystic acid and oleanolic acid in Gleditsiae Fructus Abnormals and Gleditsiae Sinensis Fructus is presented in Table 1.

| Item | Sample | Production/collection area | Content (g kg⁻¹)±SD | Echinocystic acid | Oleanolic acid |
|------|--------|----------------------------|----------------------|-------------------|----------------|
| A    | Gleditsiae Fructus Abnormals | Shandong (HK Market) | 17.81 ± 2.31 | 22.78 ± 2.37 |
| B    | Ditto | Shandong (HK Market) | 20.99 ± 2.86 | 22.67 ± 0.61 |
| C    | Ditto | Shandong (HK Market) | 27.95 ± 1.73 | 19.22 ± 2.68 |
| D    | Ditto | Shandong (HK Market) | 12.91 ± 3.42 | 19.42 ± 1.91 |
| E    | Ditto | Guangzhou, Guangdong | 24.18 ± 1.82 | 21.51 ± 0.48 |
| F    | Ditto | Yuncheng, Shanxi | 21.05 ± 2.60 | 20.48 ± 2.83 |
| G    | Ditto | Anguo, Hebei | 15.46 ± 0.46 | 18.22 ± 1.33 |
| H    | Ditto | Tai'an, Shandong | 16.44 ± 3.21 | 20.24 ± 2.08 |
| I    | Ditto | Shanggu, Henan | 17.88 ± 0.11 | 21.12 ± 1.43 |
| J    | Ditto | Lintong, Shanxi | 22.93 ± 3.13 | 23.24 ± 3.03 |
| K    | Gleditsiae Sinensis Fructus | Guangzhou, Guangdong | 20.88 ± 2.23 | 15.99 ± 0.81 |
| L    | Ditto | Lintong, Shanxi | 18.32 ± 0.92 | 14.77 ± 1.69 |

*Values are expressed in g kg⁻¹ of dried fruit mass. Mean ± SD, n = 3.

Kuwahara et al. [17] reported that Gleditsia sinensis is extensively used as a medicinal plant in Asian countries, especially in China; triterpenes, alkaloids, and sterols are isolated from Gleditsia species, and among them, triterpenoid saponins are very principal metabolites owing to their numerous pharmacological activities. Wang et al. [18] indicated that arbuscular mycorrhization is advantageous for the growth of young G. sinensis plants. Cai et al. [19] reported that the thorns of Gleditsia sinensis have been historically applied in Chinese medicine and also considered one of the elemental therapeutic herbs. Cai et al. [19] indicated the potential of Gleditsia sinensis extract (GSEE) in Hepatocellular carcinoma (HCC) treatment, and expand the understanding of miRNA-related mechanisms in the anticancer effects of GSE. Chow et al. [20] suggested that Gleditsia sinensis fruit extract (GSE) could be potentially used as an angiogenic inhibitor in not only solid tumour, but also leukaemia therapy. Lu et al. [21] found that the saponin fraction isolated from the fruits (SFGS) is considerably able to prevent angiogenesis by interfering with multiple steps. Jian et al. [22] indicated that G. sinensis gum has potential to produce value-added oligosaccharides in food industries. Lee et al. [23] indicated that Gleditsia sinensis ethanolic extract (GSEE) could be a vital novel therapeutic agent for the treatment of allergic asthma. Dui et al. [24] demonstrated that the ethanolic extract from the anomalous fruits of Gleditsia sinensis possesses antiallergic and anti-inflammatory activities, which may mediated by decreasing the release of mediators like histamine from mast cells and also weakening the inflammatory action of all these mediators. Hou et al. [25] stated that the saponin fraction from anomalous fruits of Gleditsia sinensis Lam. (SFGS) should be a candidate important therapeutic agent for...
the physical activity. Park et al. [27] suggested the application of (EEGS) in both treatment and prevention of vascular proliferative diseases. Lee et al. [28] found that the water extract of Gleditsia sinensis thorns (WEGST) inhibit prostate cancer progression in different stages, such as collagen-mediated adhesion and migration, and it might supply further development for the therapeutic use of WEGST in the treatment of prostate cancer progression. Wen et al. [42] found that isolation and identification of the nematode-antagonistic compounds in the fruit of G. sinensis would specify whether these chemicals are potential sources of biologically based nematicides. Zhou et al. [43] revealed that the crude ethanol extract of G. sinensis spines was partitioned sequentially with solvents of increasing polarity. In their experiment, ethyl acetate fraction, which showed the most significant antibacterial activities among the solvent fractions was further isolated by column chromatograph, yielding seven phenolic compounds including gallate (1) and caffeic acid (7), and five flavonoids, dihydrokaempferol (2), eriodictyol (3), quercetin (4), 3,3',5,7-pentahydroflavanone (5) and (−)-epicatechin (6).

2.2.2. Shallot (Allium ascalonicum L.)

Shallot is one of the most important vegetable crops in various local cuisines in different part of the world [44]. Greek history and literature mention shallots. They most likely originated in Southeast Asia and from there, spread into India and the Mediterranean region. Shallot is a hardy member of the onion family that is famous for its delicate, meaty, onion-like flavor. Persian shallot is native and endemic of Iran and grows as a wild plant across Zagross mountains at high elevations of different states from Northwestern to Southern of Iran with the climate of very cold to moderate cold [45, 46]. The benefit of shallot is as a source of carbohydrate, vitamin A, B, and C. Fasihzadeh et al. [48] noted that 1-Butene-1-methylthiohydral-(Z) (18.21%). Methylymethylthiohydral-1dial (8.41 %), Dimethyl tetrathiol (6.47 %), Piperitzenone oxide (4.55 %) are the most abundant components of Persian shallot and comprised 37% of the essential oil. Ebrahimi et al. [47] showed that Iranian shallot landraces are influential in mineral elements and essential fatty acids content and are recommended for human nutrition. Sittisart et al. [48] showed that shallots extracts contained some polyphenols such as apigenin, gallic acid, catechin, quercetin, kaempferol and tannic acid which are famous compounds possessing antifungal activity. Golubkina et al. [49] indicated that shallot is an outstanding candidate for the health-centered strategy of producing functional foods with high levels of Se and antioxidants; and the utilization of arbuscular mycorrhizal fungi and selenium application represent environmentally friendly strategies to increase the overall yield and quality performances of shallot bulbs. Fattorusso et al. [50] reported two new furostanol saponins, named ascaloniside Al/A2 (1a/1b) and ascaloncoside B(4), respectively, along with compounds 2a and 2b. Phaiphan et al. [51] discovered that heating and shallot supplementation can significantly enhance the quality of apple juice. Yin et al. [52] suggested the use of shallot and scallion oils which may enhance lipid and microbial stability. Racisi et al. [53] concluded that the application of 3 % ajwain seed extract gave the best antioxidant and antimicrobial activities, besides sensory, up to 15 days of storage, followed by 3 % shallot fruit extract. Abdelrahman et al. [54] provided evidence for the anticancer from shallot plants and a strong foundation for more investigations to build theoretical bases for cell apoptosis and development of novel anticancer drugs. Sefi et al. [55] proved that shallot is a useful herb with therapeutic or preventive activity against angiogenesis related disorders. Chen et al. [56] have shown the potential of shallots for use in treating adenoviral infection activities. Krejcova et al. [57] found that the important usage of Persian shallot for the treatment of inflammatory disorders. They have introduced 2-(Methylthio)
methylathio] pyridine N-oxide with high anti-inflammatory effects. Hajian et al. [58] showed that shallot extract can dose-dependently lessen the factors related to lead induced renal damages. Falahati et al. [59] indicated that crude juice of shallot has anti-candidal activity and might be promising in treatment of candidiasis. Kongkaew and Phichai [60] found that dried shallot powder, which was practical at inhibiting the growth of Trichoderma spp. isolated from Yanagi mushroom. Amin et al. [61] noticed that based on the antimicrobial compounds, shallot can be effective medicine for treatment of dermatomycosis and other infectious diseases. Jalal et al. [62] found that Iranian shallot extracts appear to improve learning and memory impairments in fructose-fed rats. Sadat Hosseini et al. [63] found that the Persian shallot extract can be considered as a potential candidate as a natural drug for both prevention and treatment of human hepatoma. Iranian shallot extracts appear to enhance learning and memory impairments in fructose-fed rats [64]. Faraji et al. [65] stated that the shallot extract was preferred in both terms of reducing microbial growth and suitable sensory properties. Kazemian et al. [66] noted that hydroalcoholic shallot extract increases the number of germ cells in mice tested and helps amplify the sexual ability of male mice. Shallot as traditional herbal medicine are for febrifuge, diabetes, blood sugar and blood cholesterol, prevents thickening and hardening of the blood vessels and also ulcers [67]. Setyadjiit and Sukash [67] also reported that its powder is generally used as industrial raw materials such as in snacks production, seasoning in cooking, and medicine. Persian shallot has been reported to have a range of health benefits which include anticarcinogenic, hypoglycemic, hypolipidemic, antioxidant, antibiotic properties, kidney and liver protective impacts [45]. Some important components found in Persian shallot [45] (Table 2). The most important medicinal properties of Persian shallot [45] (Table 2). The most important health benefits of shallots (Table 2). Traditional Asian medicinal plants can consider as an important key in the treatment and prevention of many diseases [68–72].

| Some components found in Persian shallot [45] | Medicinal properties of Persian shallot [45] | The most important health benefits of shallots |
|---------------------------------------------|---------------------------------------------|---------------------------------------------|
| Aliacin                                     | Antibiotic properties                        | Cut Cancer Risk                              |
| Saponins                                    | Hypolipidemic properties                     | Improve Heart Health                         |
| Sapogogens                                  | Anticancer properties                        | Aid Detoxification                           |
| Ajoene                                      | Antioxidant properties                       | Help Control Diabetes                        |
| Sulphuric compounds (thiosulfinates)        | Hypoglycemic properties                      | Improve Brain Health                         |
| Flavonoids: Quercetin and Kaempferol        | Kidney protective properties                 | Help Fight Obesity                           |
| Mineral Elements                            | Hepatoprotective properties                 | Help Treat Allergies                         |
| Essential fatty acids                       |                                             | Boost Bone Health                            |
| Folic acid                                  |                                             | Might Maintain Vision Health                 |
| Protein                                     |                                             | Boost Immunity                               |
| Fiber                                       |                                             | Improve Skin Health                         |
| Vitamin C                                   |                                             | Enhance Abdominal Health                    |
|                                             |                                             | Keep Hair Healthy                            |

Conclusion and recommendations.

Gleditsia sinensis Lam. (G. sinensis) is a perennial arbour spread in most parts of the world, especially in China. It is a classical traditional Chinese medical herb. Its different parts named Da Zao Jiao (fruit), Zhu Ya Zao (anomalous fruit), Zao Jia Zi (seed), Zao Jia Ye (leave), Zao Jiao Ci (thorn), and Zao Jiao Gen Pi (radix cortexes), have long been used in traditional herbal Chinese medicine (TCM). The most important components of Gleditsia sinensis are triterpenoid saponins, triterpenes, flavonoids, alkaloids, phenolics, sterols, and their derivatives are responsible for great pharmacological effects, and they is it has been considered as a medicinal treasure. It has been reported that Gleditsia sinensis Lam thorn (GST) possesses a wide spectrum of pharmacological activities such as antioxidant, anti-inflammatory, anti-microbial, anti-angiogenic and also anti-tumor effects. Its fruit is antibacterial, antifungal, antitussive, antimicrobial, expectorant, haemostatic and stimulant. The seed is emetic, expectorant, decongestant and purgative, and the root bark is anthelmintic and antifebrile. Shallot is an important part of diet of many countries, especially in Asian countries and its fantastic medicinal effects have been proved. Historically, the shallot has been used for both its nutritional and aromatic properties in Iranian, Indian, Chinese, Asian, French and Mediterranean cooking. Like onions, shallots are a member of the Allium family, but their flavor is richer, sweeter, yet more potent. The most important benefits of shallots are high source of antioxidants, improve heart health, cancer prevention, and diabetes, anti-inflammatory, antimicrobial, might help fight obesity, and help to prevent or treat allergies. The demand for shallot products is increasing every year with increase population growth and food industries. More clinical studies may necessary to uncover the numerous substances and their effects in Chinese honey locust and shallot that contribute to public health.

Acknowledgements.

Thankful to Faculty of Biotechnology, Chinese Academy of Agricultural Sciences for supporting this research.

Conflicts of Interest.

It is declared that the authors neither have any financial gain nor conflict of interests regarding this paper.

REFERENCES

1. Shahrajabian, M.H., Sun, W., Cheng, Q. (2019). The influence of traditional Iranian and Chinese medicine on western and Islamic countries. Asian Journal of Medical and Biological Research, 5(2), 94–99. DOI: 10.3329/ajmbr.v5i2.42490.
2. Shahrajabian, M.H., Sun, W., Cheng, Q. (2019). Modern pharmacological actions of Longan fruits and their usages in traditional herbal remedies. Journal of Medicinal Plants Research, 7(4), 179–185.
3. Shahrajabian, M.H., Sun, W., Cheng, Q. (2019). Jujube, a super-fruit in traditional Chinese medicine, heading for modern pharmacological science. Journal of Medicinal Plants Research, 7(4), 173–178.
4. Ogáñ, P.O., Li, J., Xue, X., Shahrajabian, M.H., Ergini, E.A. (2018). Impact of bio-fertilizer or nutrient on Spinach (Spinacea Oleracea) growth and yield in some province soils of P.R. China. Cercetari Agronomice in Moldova, 2(174), 43–52. DOI: 10.2478/cerce-2018-0015.
5. Shahrabian, M.H., Khoshkharam, M., Sun, W., Cheng, Q. (2019). The effect of pretreatment factors on seed germination and seedling growth of anise (Pimpinella anisum L.). *Middle East Journal of Scientific Research*, 5(1), 86–93. DOI: 10.23884/mesr.2019.5.1.09.

6. Shahrabian, M.H., Sun, W., Cheng, Q. (2019). A review of ginseng species in different regions as a multipurpose herb in traditional Chinese medicine, modern herbalogy and pharmacological science. *Journal of Medicinal Plants Research*, 13(10), 213–226. DOI: 10.5897/JMPR2019.6731.

7. Soleymani, A., Shahrabian, M.H. (2012). Response of different cultivars of fennel (Foeniculum vulgare) to irrigation and planting dates in Isfahan. *Iran. Research on Crops*, 13(2), 656–660.

8. Ogbai, P.O., Shahrabian, M.H., Xue, X. (2013). Changes in germination and primarily growth of three cultivars of tomato under diatomite and soil materials in autoirrigation system. *International Journal of Biological Science*, 3(5), 80. DOI: 10.5539/ijbs.v3n5p80.

9. Wang, L., Hui, Y., Jiang, K., Sun, G., Wan, J., Yan, Y., Wang, Y., Li, J., Wang, P., Bi, K., Wang, T. (2018). Potential of near infrared Gleditsia sinensis thorns on human colon cancer HCT116 cells in vitro and in vivo. *Cer cetariae Agronomiae in Moldova*, 3(175), 25–41. DOI: 10.2478/cecreo-2018-0023.

10. Soleymani, A., Shahrabian, M.H. (2018). Changes in germination and seeding growth of different cultivars of cumin to drought stress. *Cer cetariae Agronomiae in Moldova*, 1(173), 91–100. DOI: 10.2478/cecreo-2018-0008.

11. Wang, Z., Zong, X., Jia, Z., Nai, X., Guo, D., Cheng, J. (1999). Tripterigenian saponoids from Gleditsia sinensis. *Phytochemistry*, 52, 715–722. DOI: 10.1016/S0031-1820(98)00238-1.

12. Wang, L., Hui, Y., Jiang, K., Sun, G., Wan, J., Yan, Y., Wang, Y., Li, J., Wang, P., Bi, K., Wang, T. (2018). Potential of near infrared spectroscopy and pattern recognition for rapid discrimination and quantification of Gleditsia sinensis thorn powder with adulterants. *Journal of pharmaceutical and biomedical analysis*, 160, 64–72. DOI: 10.1016/j.jpba.2018.07.036.

13. Liu, X.Y., Zhang, Z. (2013). Quantitative analysis of gleditsia saponins in the fruits of Gleditsia sinensis Lam. by high performance liquid chromatography. *Journal of pharmaceutical and biomedical analysis*, 75, 41–46. DOI: 10.1016/j.jpba.2012.11.007.

14. Cheung, F., Guo, D., Chan, A.S.C. (2003). Antioxidant effects of the fruit hull of Gleditsia sinensis on LPS-induced acute lung injury in rats transplanted with hepatocellular carcinoma cells. *Carcinogenesis*, 24, 1179–1184. DOI: 10.1093/carcin/24.7.1179.

15. Hou, L., Yue, D., Chan, W., Feng, X.Y. (2008). Amelioration of collagen-induced arthritis in mice by a saponin fraction from Gleditsia sinensis. *International Journal of Oral Science*, 11, 269–273. DOI: 10.3892/ijo.212.269.

16. Lu, D., Xia, Y., Tong, B., Zhang, C., Pan, R., Xu, H., Yang, X., Dai, Y. (2012). In vitro angiogenesis effects and active constituents of the saponin fraction from Gleditsia sinens. *Integrative Cancer Therapies*, 11(4). DOI: 10.1017/S1347352411423777.

17. Jeong, H.L., Zhu, L.W., Zhang, W.M., Sun, D.F., Jiang, J.X. (2013). Enzymatic production and characterization of mammalian growth hormone from Gleditsia sinensis. *Journal of Pharmaceutical and Biomedical Analysis*, 12(2), 269–273. DOI: 10.1016/j.jpba.2012.12.029.

18. Lee, J.K., Shin, I.S., Seo, C.S., Ha, H., Shin, H.K. (2011). Antiasthmatic effects of Gleditsia sinensis in an ovalbumin induced acute lung injury model. *International Journal of Asthma*, 5, 528–537. DOI: 10.1016/j.ijasth.2011.01.025.

19. Ge, J., Hu, Y., Guo, L., Wang, C., Sun, W., Shahrajabian, M.H. (2018). Effects of GA3 and ABA on the germination of dormant oat seeds. *Journal of Medicinal Plants Research*, 12(2), 269–270. DOI: 10.1048/jmpr-2017-0034.

20. Yi, J.M., Kim, J.H., Lee, Y.J., Hong, J.T., Bang, O.S., Kim, N.S. (2015). In vivo anti-inflammatory effects of Gleditsia sinensis thorn extract of Gleditsia sinensis thorn on human colon cancer HCT116 cells in vitro and in vivo. *Cer cetariae Agronomiae in Moldova*, 3(175), 25–41. DOI: 10.2478/cecreo-2018-0023.

21. Christman, C.S., Beh, P.S.L., Jung, H., Hay, J.M., Lee, J.K., Go, Y., Hwang, Y.H., Park, K.I., Cho, W.K., Ma, J.Y. (2018). The fruits of Gleditsia sinensis Lam. inhibits adiogenesism through modulation of mitotic clonal expansion and STAT3 activation in 3T3-L1 cells. *Journal of Ethnopharmacology*, 222, 61–70. DOI: 10.1016/j.jep.2018.04.029.

22. Yi, J.J., Kim, J.H., Park, K.S., Lee, M., Lee, J.Y., Hong, J.T., Bang, O.S., Kim, N.S. (2015). In vivo anti-inflammatory effects of the ethanol extract of Gleditsia sinensis thorns on human colon cancer HCT116 cells in vitro and in vivo. *Cer cetariae Agronomiae in Moldova*, 1(173), 91–100. DOI: 10.2478/cecreo-2018-0008.

23. Liu, D., Xia, Y.-F., Tong, B., Zhang, C.-F. (2014). In vitro anti-angiogenesis effects and active constituents of the saponin fraction from Gleditsia sinensis. *Integrative Cancer Therapies*, 3(5), 446–457. DOI: 10.1177/15473541144242377.

24. Li, J., Li, H., Wu, Q., Li, H., Li, H., Li, H. (2016). Echinocystic acid inhibits RANKL-induced osteoclastogenesis by regulation NF-kB and ERK signaling pathways. *Biochemical and Biophysical Research Communications*, 477, 673–677. DOI: 10.1016/j.bbrc.2016.06.118.

25. Yi, J.J., Park, J.S., Oh, S.M., Lee, J., Kim, J., Oh, D.S., Bang, O.S., Kim, N.S. (2012). Ethanol extract of Gleditsia sinensis thorn suppresses angiogenesis in vitro and in vivo. *BMC Complementary and Alternative Medicine*, 12, 243. DOI: 10.1186/1472-6882-12-243.

26. Zhang, L.J., Zhu, J.Y., Sun, M.Y., Song, Y.N., Rahman, K., Peng, C., Zhang, M., Ye, Y.M., Zhang, H. (2017). Anti-inflammatory effects of Man-Pen-Fang - a Chinese herbal compound, on chronic pelvic inflammation in rats. *Journal of Ethnopharmacology*, 208, 57–65. DOI: 10.1016/j.jep.2017.06.034.

27. Lee, J.S., Cho, H., Kim, H., Park, K., Park, S.K., Ha, S.D., Kim, W.J., Moon, S.K. (2009). Inhibitory effects of the ethanol extract of Gleditsia sinensis thorns on human colon cancer HCT116 cells in vitro and in vivo. *Oncology Reports*, 22, 1505–1512. DOI: 10.3892/oo_0000594.
D O С Л І Д Н І Й І Н С Т І Т У Т - S., Tran, L.S. (2017). Isolation and characterization of Cepa2, a natural thione and related sulfur compounds from the spines of Gleditsia sinensis Lam. *Annual Review of Plant Biology, 68*, 112–121. DOI: 10.1146/annurev-arplant-052016-040602.

40. Daryaei, A., Zarei, A., Kianpour, S., Hosseini, M.N., Hosseini, M.H., Moradi-Sardareh, H., Shahrajabian, M.H., Sun, W., Cheng, Q. (2020). Chinese star anise (Illicium verum) and pyrethrum (Chrysanthemum cinerariifolium var. aggregatum) varieties in Ethiopia. *Journal of Forestry Research*, 31(1), 105–112. DOI: 10.1007/s11676-020-05454-2.

41. Fasihzadeh, S., Lorigooini, Z., Jivad, N. (2016). Chemical constituents of Allium stipitatum regel (Persian shallot) essential oil. *Der Pharmaceutische Letter, 8*(1), 175–180.

42. Elbrihim, R., Zamani, Z.A., Kashi, A.A.K., Jabari, A. (2008). Comparison of fatty acids, mineral elements of 17 Iranian shallot landraces (Allium hirtifolium Boiss.). *Journal of Agricultural and Food Chemistry*, 56(1), 61–68.

43. Setyadjit, Sukasih, E. (2015). Effect of addition of filler on the product quality and nutritional value of stuffed frustles made from onion and shallot. *International Journal of Plant & Food Sciences*, 18(4), 121–128. DOI: 10.1007/s13795-015-0060-8.

44. Tabor, G. (2018). Development of seed propagated shallot (Allium cepa L. var. aggregatum) varieties in Ethiopia. *Scientia Horticulturae, 240*, 89–93. DOI: 10.1016/j.scienta.2018.05.046.

45. Moradi, Y., Moradi-Sardareh, H., Ghasemi, H., Moghimi, N., Moradi, M.N., Hosseini-Zijoud, S.M. (2013). Medicinal properties of Persian shallot. *European Journal of Experimental Biology, 3*(1), 371–379.
М. Н. Шахрайабан, В. Сун, М. Кхошхарам, Н. Шен, К. Ченг

ИЗУЧЕНИЕ ГЛЕДИЧИИ КИТАЙСКОЙ (GLEDITSIA SINENSIS) И ЛУКА-ШАЛОТ (ALLIUM ASCALONICUM L.) ДЛЯ ИНТЕГРАЦИИ ТРАДИЦИОННОЙ КИТАЙСКОЙ МЕДИЦИНЫ В МЕДИЦИНУ ДРУГИХ СТРАН С ЦЕЛЬЮ УЛУЧШЕНИЯ ЗДОРОВЬЯ НАСЕЛЕНИЯ

Здоровье населения является важной составляющей развития страны, поскольку работоспособность и безопасность работников на рабочем месте зависят от состояния их здоровья. Токсичные вещества, которые используют в некоторых производственных процессах, часто вызывают аллергию, воспалительные процессы кожи и внутренних органов, а иногда диабет и рак. Для укрепления иммунитета и улучшения здоровья работников может быть рекомендована традиционная китайская медицина, которая добилась больших успехов. Целью этого исследования является обзор полезных свойств широко используемых в традиционной китайской медицине гледичии китайской (Gleditsia sinensis) и лука-шалот (Allium ascalonicum L.), которые могут быть использованы для укрепления иммунитета и улучшения здоровья работников. Поиск литературы проводился в Medline, Research Gate, Scopus, PubMed и Google Scholar Databases. Ключевыми словами были Chinese honeylocust, shallot, traditional Chinese medicine, Asian medicine and modern pharmaceutical Sciences. Соответствующие статьи на английском языке исследователей из разных стран, в которых рассматриваются целебные свойства гледичии китайской и лука-шалот, были собраны и проанализированы. Гледичия китайская (Gleditsia sinensis) – это многолетнее растение, распространенное в большинстве частей мира, особенно в Китае, является традиционным китайским лечебным растением. Наиболее важными компонентами гледичии китайской являются трипеновые сапонины (Triterpenoid saponins), трипенены, флавоноиды, алкалоиды, фенольные кислоты, стероиды и их важные производные, имеющие огромную лечебную силу. Её плоды являются анальгетиками, противомикробными, противовоспалительными, вяжущими, рвотными, отхаркивающими, кровоостанавливающими и стимулирующими средствами. Семена растения используют как рвотное, отхаркивающее, противовоспалительное и слабительное средство, а корень – как глистогонное, так и противовоспалительное средство. Наиболее важные преимущества лука-шалот – это высокое содержание антиоксидантов, которые улучшают здоровье сердца, обладают противовоспалительными, антимикробными свойствами, имеют профилактическое действие в отношении рака и диабета, могут быть полезными в борьбе с ожирением, а также помогают предотвратить или лечить аллергию. Полученные результаты свидетельствуют о потенциале гледичии китайской и лука-шалот как в пищевой, так и фармацевтической промышленности. Спрос среди населения на продукты с использованием лука-шалот растет с каждым годом с развитием пищевой промышленности. Есть мнение, что могут потребоваться дополнительные клинические исследования, чтобы раскрыть потенциал этих растений и влияние их многочисленных веществ на общественное здоровье.

Ключевые слова: здоровье населения; укрепление иммунитета работников; гледичия китайская; лук-шалот; традиционная китайская медицина.