время выращивания колонии могут занимать всю поверхность твердой питательной среды.

Azotobacter chroococcum K1, за исключением того, что образование колоний происходит медленнее, чем у вышеуказанного штамма. При повышении концентрации соли происходит уменьшение размеров клеток. В соленой среде цвет колоний остается неизменным, а максимальный диаметр колонии приобретают на 6-7 день выращивания. После этого изменения размеров колоний не наблюдается. Оптимальными условиями развития считаются pH 6,6-7,0 и температура 28-30^{0}C. Рост также наблюдается при 35-37^{0}C градусах, однако размеры колоний меньше, чем при оптимальных условиях.

Заключение. В проведённых исследованиях были изучены 26 штаммов азотабактера, у 14 штаммов наблюдался синтез ИСК, а у 12 штаммов фитогормональная активность отсутствовала. Наиболее солеустойчивым оказался *Azotobakter* -A-7.

Литература. *1. Springer, Singapur, Vani, Sartaj A., Subhash Chand, Muneeb A. Vani, M. Ramzan va Xolid Rahman Hakim. "Azotobakter chroococcum - qishloq xo'jaligida potentsial bio o'g'it: umumiy ko'rinish." Tuproqshunoslik: qishloq xo'jaligi va ekologik istiqbol (2016): 333-348. 2.Sharma, K., Dak, G., Agrawal, A., Bhatnagar, M. va Sharma, R., (2007). Fosfat eruvchan bakteriyalarning Cicerarietinum urug'larining o'sishi va ko'chat o'sishiga ta'siri. O'simlik tibbiyoti va toksikologiyasi jurnali, 1 (1), s.61-63. 3.Abo-Amer A.E., Abu-Garbiya M.A., Soltan E.S.M., Abd El-Rahim V.M. Qishloq xo'jaligi tuproqlaridan og'ir metallarga chidamli Azotobacter chroococcumning izolyatsiyasi va molekulyar tavsifi va ularning bioremediatsiyada qo'llanilishi. Geomikrobiol. J. 2014;31(7):551–561.*

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STUDY OF THE STAGES OF EMBRYONİC DEVELOPMENT OF EGGS OF *GANGULETERAKİS DİSPAR* (SCHRANK, 1790) İN SOİL

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In order to study the stages of embryonic development of ganguleterakis eggs in different types of soils, 2 types of soil (mountain forest brown and gray - brown) were taken and the obtained helminth eggs were buried in these soils. On mountain forest brown soils, the division phase ended on the 12th day, the blastula phase on the 29th day, the larval formation phase ended on the 36th day, and on gray-brown soils, the division phase ended on the 14th day, the blastula phase ended on the 32nd day, and the larval formation phase ended on the 42nd day. Thus, under in vitro conditions, the embryonic development of Ganguleterakis

dispar eggs in water was completed in 7 days at a temperature of 24°C, in various types of soils: in typical mountain–forest brown soil-in 36 days, in gray-brown soil-in 42 days, during which time larvae fully developed inside the eggs. ***Keywords.*** *Embryonic development in water and various types of soil, Ganguleterakis dispar eggs, division stage, blastula stage, larval formation stage.*

ИЗУЧЕНИЕ СТАДИЙ ЭМБРИОНАЛЬНОГО РАЗВИТИЯ ЯИЦ GANGULETERAKIS DISPAR (SCHRANK, 1790) В ВОДЕ И ПОЧВЕ

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С целью изучения эмбриональных стадий развития яиц гангулетеракиса в различных типах почв были взяты 2 типа почвы (горно - лесная коричневая и серо-бурая), и полученные яйца гельминтов были закопаны в этих почвах. В горных лесных бурых почвах стадия деления завершается на 12-й день, стадия бластулы-на 29-й день, стадия формирования личинки-на 36-й день, а в серо-бурых почвах стадия деления завершается на 14-й день, стадия бластулы-на 32-й день, а стадия формирования личинки-на 42-й день. Так, в условиях in vitro эмбриональное развитие яиц Ganguleterakis dispar в воде завершилось за 7 дней при температуре 24°C, в различных типах почв: в типичной горно-лесной бурой почве-за 36 дней, в серо-бурой почве-за 42 дня, за это время личинки внутри яиц полностью развились. ***Ключевые слова.*** *Эмбриональное развитие в воде и различных типах почвы, яйца Ganguleterakis dispar, стадия деления, стадия бластулы, стадия формирования личинки.*

Introduction. Poultry farming is one of the industries that recoups its investments in a short time. Reliable food supply of the population is one of the priority issues facing each country. Therefore, in order to fully meet the needs of the population in basic foodstuffs, it is very important to consistently carry out appropriate measures, and this work should be carried out consrcutively. These tasks set by the state, namely the development of poultry farms, which are a branch of agriculture, the population's need for healthy poultry meat and eggs are being solved in a planned form. For this purpose, extensive poultry farms that meet modern requirements have been created in our republic, and this work continues to this day. But despite this, more than half of the population of our republic lives in villages, and they keep and raise waterfowl (geese and ducks) in small farms. There are still many factors that hinder the development of small private and farm poultry farms. The most important of these factors are infectious and invasive diseases of birds. In farms where waterfowl are kept, invasive diseases are more common than infectious ones, which hinders the intensive

development of these farms and causes serious damage. Of invasive diseases Ganguleteracidosis is occurred more often in swimming birds [16.19.20.].

Geese become infected with ganguleterakidosis via alimentary way when swallowing them through food and water. Ingested ganguleterakis eggs reach the invasive stage at the appropriate temperature, humidity and oxygen in the external environment. Helminth eggs that have passed the stages of embryonic development, including ganguleterakis eggs, become invasive and infected when they are swallowed by healthy goslings [17].

Material and method. Our research was carried out in the laboratory of Parasitology of the Veterinary Scientific Research Institute. After the separation of the collected ganguleteraks into males and females by sex, the males were fixed in Barbagallo solution. On the other hand, female ganguleterakis were placed in water in Petri dishes, and after they laid eggs, helminths were taken from there. The resulting eggs were stored in water in Petri dishes at a temperature of 24°C on a thermostat. The stages of the embryo development process in the egg were determined using a microscope of the ”Motic" brand. To determine the stage of development of ganguleterakis eggs, an eyepiece 10, a lens 40 were used, to determine helminth eggs, an eyepiece 10, a lens 10. The stages of development of ganguleterakis larvae inside the eggs were sequentially photographed using a PA-4 imaging apparatus. Ganguleterakis larvae have been found to reproduce in water under *in vitro* conditions.

The examination of helminth eggs in mountain-forest brown and gray-brown soil in order to study the stages of embryonic development of ganguleterakis eggs in various types of soils was determined by the method of Romanenko and Gudzhabidze. According to this method, 25 grams of the soil under study were placed in a glass vessel of 80-100 ml centerfuge and 3.0% sodium alkali solution was added in a ratio of 1:1. Using a glass stick, the mixture in the glass vessel of the centerfuge was well mixed and kept for 20-30 minutes, then it was centrifuged for 5 minutes at 800 rpm. The upper part was thrown away, and the soil was washed 3-5 times in a glass vessel of centrifuge. After washing the soil, 45 ml of saturated sodium nitrate solution was added to it, stirred, and centrifuged for 3 minutes. Then the glass vessel of the centrifuge was placed on a tripod and a sodium nitrate solution was carefully added (until the meniscus bulge formed) and covered with a 10x6 cm slide from above. The mixture was kept for 30 minutes in a centrifuge vial for the purpose of precipitation. At this time, nematode eggs (ganguleterakis eggs) rose above the solution and stuck to the slide. After the slide was removed, 1-2 drops of 50% glycerin solution were added to it, covered with a glass covering and subjected to microscopy. The counted eggs on the slide indicate contamination of the studied soil with helminth eggs.

Discussion of the study. Ganguleteracidosis is a very common helminthiasis among geese and ducks in Azerbaijan. It parasitizes mainly in the cecum of birds.These helminths develop in an alimentary way, without the participation of an intermediate host. Eggs are distributed to the external environment with the help of bird droppings. Larvae are formed in eggs within a week at an air

temperature of 18-20°C. In spring and summer, invasive eggs can remain viable in poultry houses and in private plots for up to 5 months. Non-invasive eggs do not lose their viability in winter and complete their development when the temperature drops. When birds swallow such eggs, they enter the cecum and begin to develop. The helminth reaches the stage of full maturity and egg laying in the cecum of a goose within 24-27 days, where it remains alive for 12-14 months.Geese are intensively infected with this helminthiasis in the summer and autumn months.

Helminths collected from the cecum of geese were used to study the stages of embryonic development of *Ganguleteracis dispar* eggs, the causative agent of ganguleteracidosis spreading among domestic waterfowl, including geese. ganguleterakis larvae have been found to reproduce in water under *in vitro* conditions. After dividing the collected ganguleterakis into males and females by sex, the female ganguleterakis settled in water in Petri dishes, and after they laid eggs, this water was purified from helminths. The resulting eggs were stored in a thermostat in water at a temperature of 24°C. Ganguleterakis eggs placed in Petri dishes were monitored daily to determine the stages of their embryonic development in water. The sample was taken from the bottom of Petri dishes using a pipette and examined under a microscope, the substrates of the stages of embryonic development of ganguleteracis eggs were regularly weighed as if they were visible under a microscope. The stages of the embryo development process in the egg were determined using a microscope of the ”Motic" brand. To determine the stage of development of ganguleterakis eggs, an eyepiece 10, a lens 40, to determine helminth eggs-an eyepiece 10, a lens 10 were used. The stages of development of ganguleterakis larvae inside the eggs were sequentially photographed using a PA-4 imaging apparatus.

According to the morphological structure there was experimented on 2 types of soils. First of all, 5 kg of each of the typical mountain forest brown and gray-brown soils were obtained from the Institute of Soil Science and Agrochemistry of ANAS for use in experiments. For the experiment, samples of gray-brown soil of the Bilasuvar region and typical mountain-forest brown soils of the Shamkir region were selected. Boxes (cases) in 15 cm wide, 30 cm long and 10 cm deep were made of wood for placing soil samples. From each of these boxes to their surface, the soil types mentioned above were filled in separately. The obtained ganguleterakis eggs were mixed with various types of soil taken with a pipette and buried to a depth of 2-3 cm in the soil in each box, wrapped first in filter paper and then in a nylon cloth. 15 wrappers were buried in each box, each of which contained 200 helminth eggs.

The soil was sprayed with water in order to maintain soil moisture at a constant level (30-50%). For experimental purposes, a sample mixed with soil and wrapped in a nylon cloth was taken from each box, and the stages of development of helminth eggs inside the eggs were observed under a microscope. The stages of the embryo development process in the egg were determined using a microscope of the ”Motic" brand. To determine the stages of development,

viability and stages of deformation of nematode eggs, an eyepiece 10 and a lens 40 were used. On the other hand, an eyepiece 10 and a lens 10 were used to identify helminth eggs, and the stages of development of ganguleterakis larvae inside the eggs were sequentially photographed. The period of reproduction of ganguleterakis larvae *in vitro* in various types of soils has been established. Various stages of helminth eggs have been studied – division into blastomeres, the process of sequential development during division, the formation of morula, the transformation of the embryo into a larva, etc.

In order to study the stages of embryonic development of ganguleterakis eggs in various types of soils, *Ganguleterakis dispar* eggs buried in wooden boxes at a temperature of 24°C in laboratory conditions were observed under a microscope. In the soil studied, helminth eggs were identified by the method of Romanenko and Gudzhabidze.

During the embryonic stages of development of ganguleterakis eggs, the first furrow of division divided the zygote into two blastomeres, and the second furrow also divided the blastomeres into two parts, resulting in four blastomeres formed at this time. The third furrow-a wide furrow divided the resulting four blastomeres into two parts, forming eight blastomeres. As the number of furrow divisions increases, the division increases, which leads to the formation of smaller blastomeres. This phase was completed in 12 days in a typical mountain forest brown soil, after which the blastula phase began. At this stage, some of the blastomeres seemed dark, and some light. Thus, the larva's head began to form inside the egg, and this phase ended after 29 days. When observed under a microscope, it was noticed that after this stage the embryo elongates and takes a cylindrical shape. As the embryo developed, the larva formed, and this stage also ended after 36 days [12.4.5].

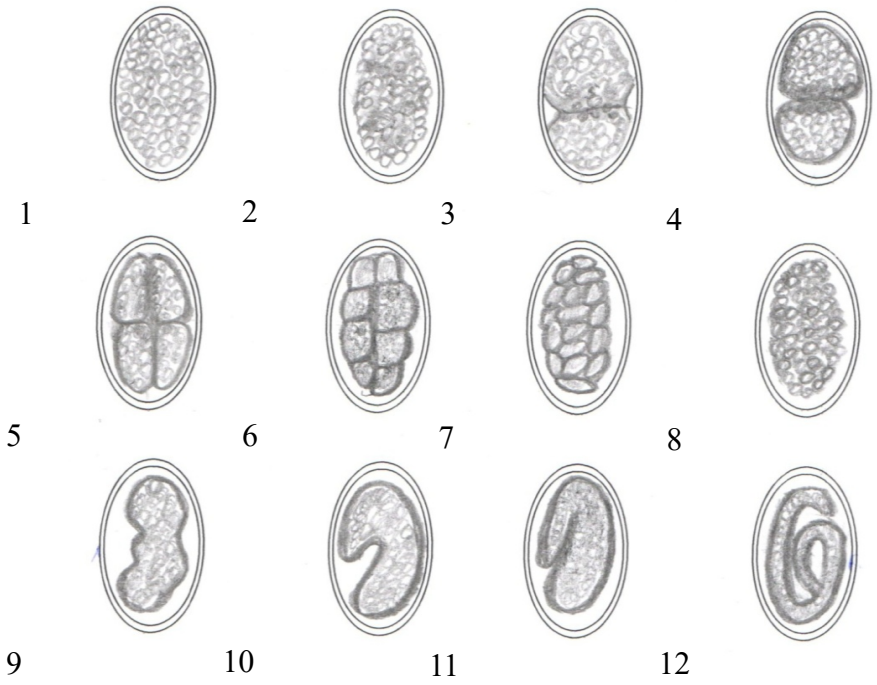

Figure 1 – Stages of embryonic development of *Ganguleteracis dispar* eggs in soil 1,2 - Ganguleterakis egg, 3 - formation of the first furrow of division,

4 - division of the blastomer into two parts, 5 - division of the blastomer into four parts, 6 - formation of eight blastomers, 7,8 - stages of the blastula, 9 - formation of the head of the larva, 10,11 - formation of the embryo, 12- formation of the larva.

In general, the formation of the larva inside the egg in a typical mountain forest brown soil was completed in 36 days. When looking through a microscope, the movement of the larvae formed inside the egg was clearly visible. The larvae regularly moved and changed their position inside the egg (Fig. 3).

The stages of embryonic development of ganguleterakis eggs in gray-brown soil are the same as in typical mountain forest brown soil. However, the fission phase ended after 14 days, after which the blastula phase began. The blastula phase was completed after 32 days. After this stage of embryo elongation, the stage of larva formation begins (Fig.4).

As the embryo developed, the larva formed, and this stage ended after 42 days. In general, the formation of the larva inside the egg in gray-brown soil was completed in 42 days. When viewed through a microscope, it seemed that the larvae were mobile and changed their position inside the egg (Table 2).

Figure 2 – Development of *Ganguleterakis dispar* inside the egg in the soil

Thus, under *in vitro* conditions on different types of soils: in a typical mountain–forest brown soil, the embryonic development of *Ganguleterakis dispar* eggs was completed after 36 days at a temperature of 24°C and after 42 days in gray-brown soil, during which the larvae inside the eggs fully developed [1.2.15].

Table – Stages of embryonic development of *Ganguleterakis dispar* eggs on different types of soils

№	Stages of development of *Ganguleterakis dispar*	Duration of embryonic stages of development of ganguleterakis eggs (at a temperature of 24°C)	
		Typical Mountain forest brown	Gray-brown
1.	Division stage	day 12	day 14
2.	Blastula stage	day 29	day 32
3.	Larvae formation stage	day 36	day 42

As a result of the research, it was found that 57.0% of *Ganguleterakis dispar* eggs (114 out of 200 eggs) hatched in typical mountain-forest brown soil, and

27.5% (55 out of 200 eggs) formed larvae in gray-brown soil, completing the stages of embryonic development. So it also depends on the humus of the soil, its composition. Even in farm conditions, discarded ganguleterakis eggs infect healthy goslings after they reach the invasive stage, and serious damage is caused to the farm as a result of infection. It follows from the conducted studies that it is necessary to carry out comprehensive measures to combat pathogens of invasive diseases of domestic waterfowl. Invasive diseases among birds can be found in almost all seasons of the year. The main reason for this is also that cowsheds are not cleaned of manure in time, the appropriate humidity and temperature are created in the manure for the development of helminth eggs, especially at high air temperatures. Untimely cleaning of sheds and playgrounds around them leads to the development of helminth eggs, which leads to a wider and more intensive spread of helminths [3.7.8].

Discussion of the result. According to the morphological structure there was experimented on 2 types of soils. In order to conduct the experiment, samples of typical mountain-forest brown soil were taken from the territory of Bilasuvar district and from the territory of Shamkir district and the stages of embryonic development of *Ganguleterakis dispar* eggs were studied at a temperature of 24°C under *in vitro* conditions. In mountain forest brown soils, the division stage ended on the 12th day, the blastula stage - on the 29th day, the larva formation stage - on the 36th day, and in gray-brown soils, the division stage ended on the 14th day, the blastula stage-on the 32nd day, and the formation stage larvae-on the 42nd day. The difference in the embryonic development of ganguleterakis eggs in different soils depends on the humus of the soil, its composition, structure.

Thus, under in vitro conditions, the embryonic development of *Ganguleterakis dispar* eggs in water was completed in 7 days at a temperature of 24 °C, in various types of soils: in typical mountain–forest brown soil -in 36 days, in gray-brown soil-in 42 days, during which time larvae fully developed inside the eggs.

References. *1. Babayev M., Gafarova Ch., Hasanov V. Modern classification of Azerbaijani soils. Baku, "Elm", 2006, p.359. 2. Hasanov Sh.G. Morpho-genetic profile of Azerbaijani soils, Baku, ”Elm", 2004, p.202. 3. Mammadov G.A., Hajiyev Y.N., Shirinov N.M. Aghayev A. A. Veterinary parasitology, 1986, p.434. 4. Nasirov A.M. Micromorphological study of helminth-infected tissues of domestic waterfowl // Kaziyeva N.S., Bunyatova K.I. // Proceedings of the Azerbaijan Society of Zoologists, volume VI, No. 1, Baku: Elm, 2014, pp.106-110. 5. Nasirov A.M. Application of ultrastructural studies in parasitology in Azerbaijan. Rzaev F.H., Gasimov E.K./Proceedings of the Zoological Institute.2015, vol.7, No. 1, pp. 105-110. 6. Rzayev F.H. On helminth infestation of domestic waterfowl (geese and ducks) in various regions of Azerbaijan / Proceedings of scientific conferences of graduate students of ANAS, Baku: Elm, 2008, pp.163-168. 7. Yusifov A.H., Akhmedov C.A., Askerov K.A., Mammadov T.A. Fundamentals of veterinary sanitation / Baku, 2006, p.232 p. 8. Mikhailova T.*

Poultry in the individual household. Moscow, Eksmo, 2013, pp. 168-2068. 9. Nasirov A.M., Bunyatova K.I., Kaziyeva N.S., Rzayev F.G. Micromorphology of nematode Ganguleterakis dispar (Schrank, 1790) / Materials of the IV All-Russian Congress of the Parasitological Society at the Russian Academy of Sciences, held on October 20-25, 2008 "Parasitology in the XXI century-problems, methods, solutions" T 2, St. Petersburg-Petersburg: Lemma, 2008, pp.208-210. 10. Bogoyavlensky Yu.K. New methods for studying the fine and ultrathin structure of parasitic nematodes (micromorphological study of somatic musculature of some nematodes of the Spirurata suborder) // Research on helminthology in Azerbaijan. Mat. scientific. sess. helminthologists of Azerbaijan. 1964. Publishing house "Elm". Baku 1970. pp. 36-42. 11.Bogoyavlensky Yu.K., Myasnikova O.V. The fine structure of the integumentary tissues of the nematode Triodontophorus minor (Loss, 1900) // Actual issues of modern parasitology. M., 1975. pp. 40-42. 12.Volkova O.V., Yeletsky Yu.K. Fundamentals of histology with histological technique. Ed. "Medicine". M., 1971. 272 p. 13. Rzaev F.G. Mechanism of action of ecologically pure anthelmintic of plant origin on the fine structure of the nematode Ganguleterakis dispar (Schrank, 1790) // Ecological Bulletin 2009, No. 2, (8), Minsk, pp.114- 119. 14. Vodianov, A.A. Morphology, biology and laboratory diagnostics of pathogens of invasive animal diseases [Text] : educational and methodological manual. At 3 h. h. 1 : Veterinary helminthology / A.A. Vodianov, S.N. Lutsuk, V.P. Tolokonnikov. – Stavropol : StGAU, 2009. – 84 p. 15. Parasitology and invasive diseases of animals [Text] : textbook for universities / M. Sh. Akbayev [et al.] ; edited by M.Sh. Akbayev. – 2nd ed., corrected. – Moscow : KolosS, 2002. – 743 p. 16. Kosminkov N.E. Biological bases of prevention of helminthiasis of animals. Uch. on vet. parasitol. – 1999. – pp. 77-80. 17. Abuladze K. I. Parasitology and invasive diseases of farm animals. – M.: Agropromizdat, 1990. – pp. 167-169. 18. Rzaev F.G. Comparison of helminthofauna of domestic waterfowl (Anser anser dom. and Anas platyrhynchos dom.) in various ecological zones of Azerbaijan // Proceedings of young scientists of the Volga region, Togliatti: Cassandra, 2013, pp.145-151. 19. Vahidova SM. Helminths of birds of Azerbaijan. Elm, Baku, 1978, 237 p. 20. Shirinov F.B. Diseases of birds. Baku: TURLAN NPM, 2003, 280 p.