How to Cite
Amini, K., Indrati, R., & Sjofjan, O. (2023). Effect of adding garlic flour (Allium Sativum) and oregano leaves (Oreganum Vulare) on carcass quality and blood biochemistry in broiler. *International Journal of Life Sciences & Earth Sciences*, *6*(1), 65-71. https://doi.org/10.21744/ijle.v6n1.2221

Effect of Adding Garlic Flour (Allium Sativum) and Oregano Leaves (Oreganum Vulare) on Carcass Quality and Blood Biochemistry in Broiler

Khairuni Amini
Master Student in Animal Science, Faculty of Animal Husbandry, Universitas Brawijaya, Malang, Indonesia
Corresponding author email: khairuni@student.ub.ac.id

Rositawati Indrati
Lecturer in Animal Science, Faculty of Animal Husbandry, Universitas Brawijaya, Malang, Indonesia
Email: rosita29@ub.ac.id

Osfar Sjofjan
Lecturer in Animal Science, Faculty of Animal Husbandry, Universitas Brawijaya, Malang, Indonesia
Email: osfar@ub.ac.id

***Abstract*---*This research aims to determine the results of adding garlic flour (Allium sativum) and oregano leaves (Oreganum Vulare) to feed on carcass quality and blood biochemistry. This research consisted of 2 stages, the research material for stage 1 was a descriptive analysis of liver histopathological changes in embryonated chicken eggs (TAB). The research material for phase II was the 200 Day Old Chick (DOC) Ross unsex strain. Average body weight 38.485 ± 0.90 g. The research methods used were laboratory experiments and field experiments using a completely randomized design (CRD) with 5 treatments and 5 replications. The treatments given were P0: Basal feed (control feed), P1: Basal feed plus 0.25% garlic flour, P2: Basal feed plus 0.5% garlic flour, P3: Basal feed plus 0.75% onion flour white, P4: Basal feed plus 1% garlic flour. The data obtained will be analyzed descriptively. Statistics use analysis of variance (ANOVA) from a Completely Randomized Design (RAL) followed by an honest significant difference test (BNJ) or Tukey Test. The results of the research were that adding garlic flour to feed influenced the parameters used. The use of garlic flour in feed had a very significant effect (P<0.01) on histopathological changes. The use of 1% garlic flour can provide the best results numerically and qualitatively.*
Keywords*---*blood biochemistry, carcass quality, garlic flour, oregano flour.

Introduction

Garlic (Allium sativum) is one of the ingredients that can be chosen to be used as a phytobiotic agent and has immunomodulatory properties. Garlic has activities including anti-atherosclerosis, antimicrobial, hypolipidemic, antithrombosis, anti-hypertension and anti-diabetes (Umatiya et al., 2018). Another ingredient besides garlic that can be used as a phytobiotic agent is oregano leaves. Oregano leaves (Oreganum vulare) have high activity as an antimicrobial agent (Simirgiotis et al., 2020). The high immunomodulatory properties of garlic (Allium sativum) and oregano leaves (Oregano vulare) are to improve the health status of broiler which can be observed through blood biochemistry including SGPT, SGOT, and ALP enzymes and by observing histopathological changes in the liver organ (Bampidis et al., 2005).

The potential of the test agent as an antiviral against ND can be inoculated at 11-day-old TAB. A definitive diagnosis of ND can be made by isolating and identifying the virus using various types of tissue culture. The most practical and frequently used method for isolating the ND virus is culturing in 9-10-day-old embryonated chicken

ISSN 2632-9425
Submitted: 09 September 2023|Revised: 18 October 2023| Accepted: Date 27 November 2023

eggs. The materials used for virus isolation are trachea or tracheal swabs, pulmonary, faeces, intestinal contents or cloacal swabs. Viral antigens in tissue can be tracked using immunohistochemical techniques (Lisnanti et al., 2019).

Blood biochemical evaluation is important to detect organ injury in birds that show clinical symptoms of the disease. The liver functions as the main organ that cleans toxic substances originating from bacteria or other chemicals. Liver health and function can be determined by measuring enzymes in the blood. Histopathological examination of the liver is carried out to observe changes in cell morphology of the tissue and as one of the efforts made to establish a diagnosis of a disease (Khattak et al., 2014; Alagawany et al., 2021).

Based on the problems that have been described, a solution is needed to increase the productivity of the broiler. The addition of garlic flour (Allium sativum) and oregano leaf flour (Oreganum vulare) in feed at certain levels can act as an immunomodulator and can improve the health status of livestock by knowing blood biochemistry and liver histopathology (Karimi et al., 2010; Panou-Filotheou et al., 2001). Meanwhile, production aspects can be assessed from the weight of internal organs and the percentage of tissue fat. Chicken liver is an organ that has a high nutritional content compared to liver sourced from other livestock (Lutfiah et al., 2021). Giving a combination of garlic flour (Allium sativum) and oregano leaves (Oregano vulare) is expected to improve the health status of livestock and increase the productivity of the broiler. Based on the above background, this research aims to find out and evaluate the effect of giving a combination of garlic flour (Allium sativum) and oregano leaf flour (Oregano vulare) in feed on carcass quality and blood biochemistry and to find out and explain the best level of giving a combination of flour doses. garlic (Allium sativum) and oregano leaf flour (Oregano vulare) in feed to influence changes in carcass quality and blood biochemistry (Priolo et al., 2002; Le Bihan-Duval et al., 1999).

Material and Methods

The research material included 200 day old chick (DOC) broiler from PT Cipta Terang Unggul Ross strain with a rearing period of 35 days. Day Old Chick has received vaccines against avian influenza, infectious bronchitis and Newcastle disease. The treatment group required a minimum number of repetitions of 5 times and each repetition consisted of 8 broilers and had received appropriate research ethics from Brawijaya University. The cages used in this research were closed house cages and used litter from rice husks which functioned to absorb chicken droppings. The cage consists of 20 units with dimensions of 70 cm in length, 80 cm in width and 70 cm in height. Each cage is filled with 7 chickens and is equipped with equipment for research such as 20 40-watt incandescent lamps which are used for lighting and heating (brooder), and a feeder. and drinking water made from plastic with a total of 20 containers each placed in each cage unit, 1 set of minor surgical tools (dissecting set) used for necropsy procedures on chickens, 1 set of organ pots used to hold the organs resulting from necropsies used For histopathological sample preparation, a room thermohygrometer is used to determine temperature and humidity, a 3 ml syringe, micropipette, water bath, microscope, object glass, cover glass, and incubator (Martins et al., 2016; Kallel et al., 2014).

This research is an experimental study with a completely randomized design (CRD) type of research. This research was divided into 5 groups and each group consisted of 5 replications and each replication consisted of 7 broilers. The treatment groups in this study were as follows:

T0: 100% broiler standard
T1: Feed + 0.25% (garlic extract and oregano leaves)
T2: Feed + 0.5% (garlic extract and oregano leaves)
T3: Feed + 0.75% (garlic extract and oregano leaves)
T4: Feed + 1% (garlic extract and oregano leaves)

Research at this stage is the maintenance stage for livestock starting from the starter phase to harvest. The second stage of research aims to observe the potential of the ingredients to be tested on livestock production performance, immunological status, and histopathology of the liver organ which is observed by the necrosis process of inflammatory cell infiltration. Livestock rearing is carried out in a pen belonging to the Faculty of Animal Husbandry, Brawijaya University in Dau with a semi-closed house type. Maintenance starts from days 1 to 35 with observations carried out directly by the research team.

Meanwhile, the materials used in this research include the following materials used: 200 broilers aged 35 days, standard BR 511 broiler feed, drinking water, flour combined with garlic flour extract and oregano leaves, 70% alcohol, entellan, PBS, hematoxylin-eosin, 10% formalin, distilled water, object glass, and cover glass.

Examination of the enzymes Aspartate Aminotransferase (AST), Alanine Aminotransferase (ALT), and Alkaline Phosphatase (ALP) was carried out at the Brawijaya University Veterinary Teaching Hospital (RSHP) using a Hematology Analyzer Rayto 7600 and Abaxis Vetscan® machine (Hacıseferoğulları et al., 2005). The quality of

internal organs can be measured using two indicators, namely liver weight and abdominal fat percentage. According to Salam (2013), the measurement of these two values is as follows: measurement of liver weight (g) is carried out after necropsy by collecting the liver organ and weighing the results in grams (gr). Abdominal fat percentage, measurement of abdominal fat weight is done by weighing the fat obtained from the fat around the gizzard and the layer that attaches between the abdominal muscles and intestines and then weighing it. The abdominal fat percentage is obtained by comparing the abdominal fat weight with the live weight multiplied by 100.

$$LAbdominal\ Fat = \frac{Abdominal\ Fat\ Weight}{Live\ Weight} \times 100\%$$

Results and Discussion

Histopathological changes

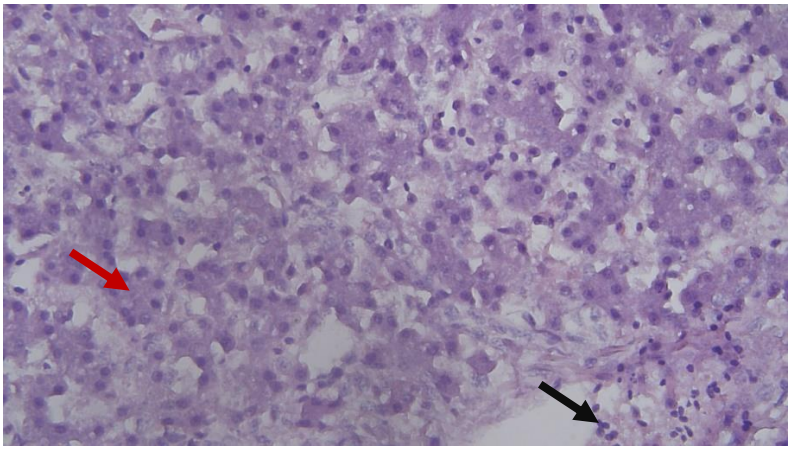

Figure 1. Histopathology of the Negative Control Group

In the negative control group, histopathological changes were seen in fatty degeneration (red arrow) and mononuclear cell infiltration (black arrow).

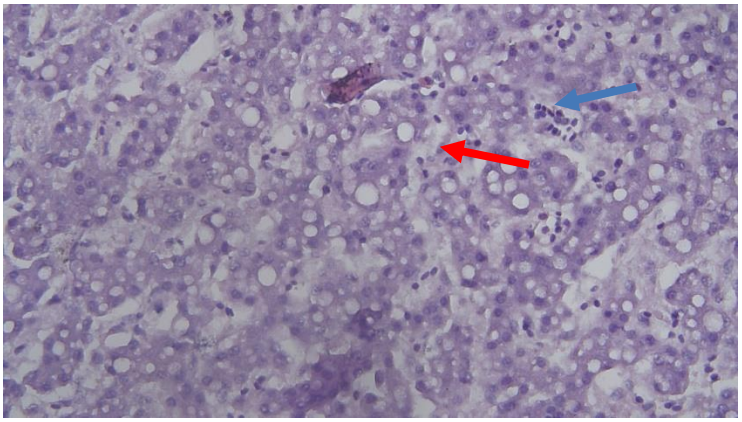

Figure 2. Histopathology of Treatment 1

In treatment 1, fatty degeneration (red arrow) and mononuclear cell infiltration (blue arrow) were seen as well as narrowed sinusoids due to pressure from surrounding hepatocytes.

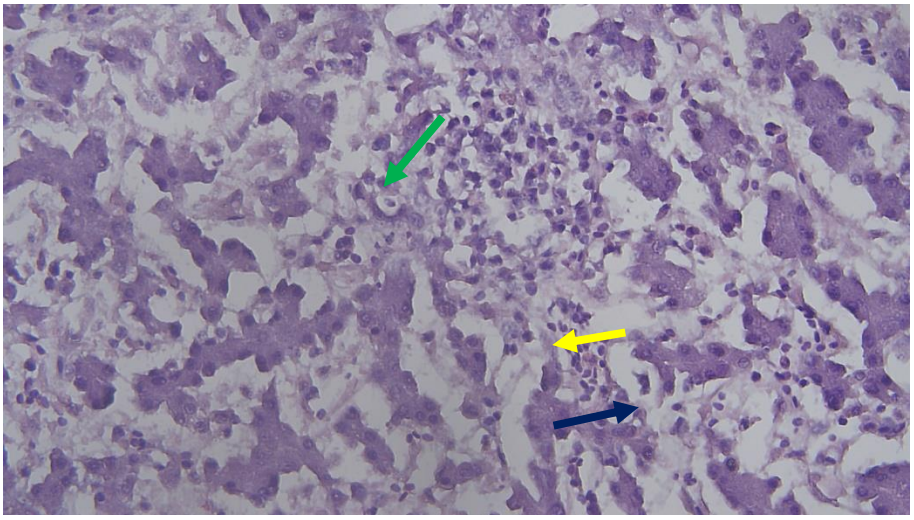

Figure 3. Histopathology of Treatment Group 2

The histopathological picture of treatment 2 shows a lot of mononuclear cell infiltration (yellow arrow), fatty degeneration (green arrow), and cells experiencing necrosis (blue arrow).

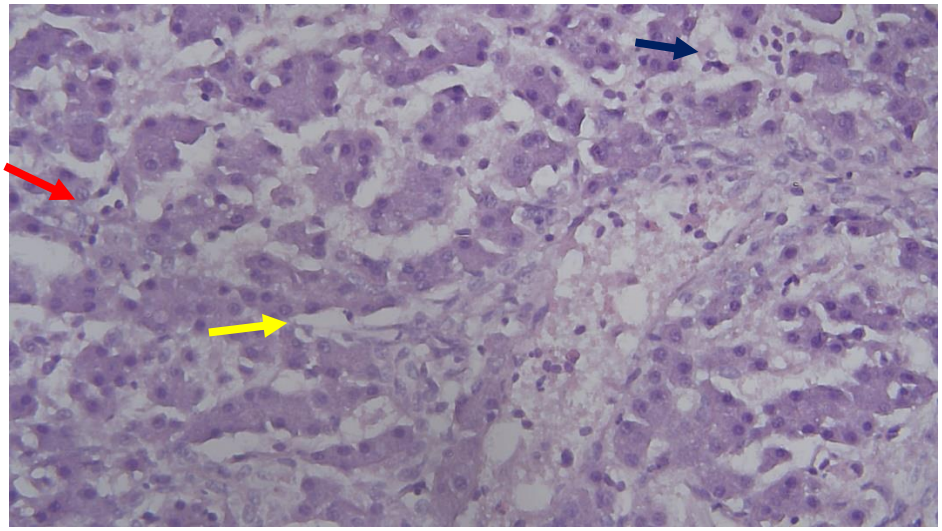

Figure 4. Histopathology of Treatment Group 3

In treatment 3, histopathological changes were visible in the form of fatty degeneration in the form of vacuoles (red arrow), necrosis (yellow arrow), cell nuclei became hyperchromatic and shrunk and mononuclear cell infiltration (blue arrow).

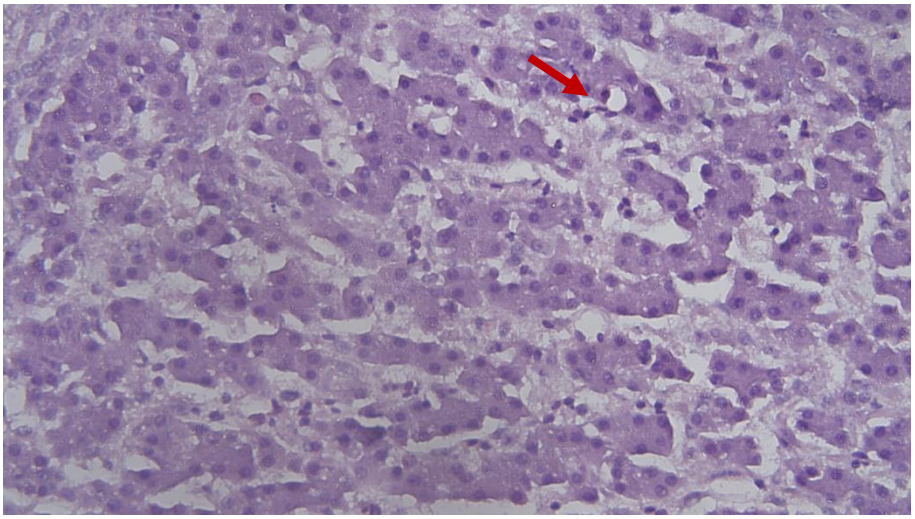

Figure 5. Histopathology of Treatment Group 4

The results of the research in treatment group 4 showed changes in liver histopathology in the form of fatty degeneration with the presence of vacuoles (red arrows) and mononuclear cell infiltration. In this group, the distance between the sinusoids was still regular and there was fat degeneration in the form of vacuoles which did not appear much (Suriani & Darmadi, 2019).

In phase 2 of the study, histopathological changes were seen, namely fatty degeneration characterized by the presence of vacuoles and necrosis. The fatty degeneration and necrosis that occurred in each treatment group ranged from mild to severe. Degeneration is an abnormal change in tissue or cell morphology. When morphological changes occur, they are generally related to functional abnormalities, if they occur continuously they will result in necrosis (Kikusato, 2021). Degenerative changes are reversible because they can return to normal. Fatty degeneration is characterized by the presence of vacuoles that vary in size and severe cases push the nucleus to the edge (Schirrmacher, 2017). Fat in the cell cytoplasm can push the cell nucleus to the edge which is visible on microscopic examination. Necrosis is a continuation of the degeneration process and is not reversible or cannot return to normal. Necrosis can be observed with the main characteristics being the presence of a nucleus undergoing pocknosis, karyorrhexis and karyolysis. Degeneration and necrosis can occur due to several causes, including lack of oxygen (Firdaus et al., 2021). The degeneration that occurs due to a lack of oxygen supply to the tissue or hypoxia is related to congestion so that the tissue lacks a blood supply that contains lots of oxygen. Cells need oxygen to maintain their survival, if cells experience hypoxia then there will be damage to the cells (degeneration) and necrosis (Brar et al., 2017). The results obtained in this study were very varied, this could be due to the varied metabolism of broilers, and varying doses of garlic powder extract.

Conclusion

The effect of using garlic flour in feed was able to have the best impact on changes in liver histopathology as well as liver weight and abdominal fat percentage in the broiler. The use of 1% garlic flour can provide the best results in numerical and qualitative terms. It is recommended to use 1% garlic flour in feed because garlic flour has a good impact on changes in liver histopathology as well as liver weight and abdominal fat percentage in broilers.

Acknowledgements

The author realizes that this thesis would not have been possible to complete without the support, assistance, guidance and advice from various parties during the preparation of this thesis.

References

Alagawany, M., El-Saadony, M. T., Elnesr, S. S., Farahat, M., Attia, G., Madkour, M., & Reda, F. M. (2021). Use of lemongrass essential oil as a feed additive in quail's nutrition: its effect on growth, carcass, blood biochemistry, antioxidant and immunological indices, digestive enzymes and intestinal microbiota. *Poultry science*, *100*(6), 101172. https://doi.org/10.1016/j.psj.2021.101172

Auza, F. A., Badaruddin, R., Hadini, H. A., & Salido, W. L. (2022). Profil Organ Dalam Broiler Diberi Serbuk Kunyit, Bawang Putih Dan Mineral Zink Sebagai Imbuhan Pakan. *J. Trop. Anim. Sci. Technology*, 172.

Bampidis, V. A., Christodoulou, V., Florou-Paneri, P., Christaki, E., Spais, A. B., & Chatzopoulou, P. S. (2005). Effect of dietary dried oregano leaves supplementation on performance and carcass characteristics of growing lambs. *Animal feed science and technology*, *121*(3-4), 285-295. https://doi.org/10.1016/j.anifeedsci.2005.02.002

Brar, R. S., Leishangthem, G. D., Gadhave, P. D., Singh, N. D., Banga, H. S., Mahajan, V., & Sodhi, S. (2017). Diagnosis of Newcastle disease in broiler by histopathology and immunohistochemistyr.

Candrayani, P. P., Utama, I. H., & Suharsono, H. (2022). Kadar Aspartat Aminotransferase dan Alanin Aminotransferase Ayam Pedaging yang Diberi Penambahan Asam Organik dalam Pakan. *Indonesia Medicus Veterinus*, *11*(2), 178–186

Carvalho, G. B. D., Martins, P. C., Rezende, P. M., Santos, J. S., Oliveira, E. D., Trentin, T. D. C., Martins, D. B., Stringhini, J. H., & Café, M. B. (2020). Hematology and serum biochemistry of broilers at the initial and growth stages submitted to different levels of digestible sulfur amino acids. *Ciência Rural*, *50*(5), 20180881.

Farrokhifar, S. H., Jafari, R. A., Majd, N. E., Tabatabaee, S. R. F., & Mayahi, M. (2013). Effects of dietary vitamin E on mucosal maltase and alkaline phosphatase enzyme activities and on the amount of mucosal malonyldialdehyde in broiler chickens. 4(4), 221–225.

Firdaus, I., Suastika, P., Merdana, I. M., & Sudimartini, L. M. (2021). Histopatologi Hepar Ayam Broiler yang Diberikan Infusa Daun Dadap (Erythrina subumbrans) dan Mengalami Stres Pengangkutan. *Indonesia Medicus Veterinus*, *10*(4), 564–575.

Gowda, S., Desai, P. B., Kulkarni, S. S., Hull, V. V., Math, A. A., & Vernekar, S. N. (2010). Markers of renal function tests. *North American journal of medical sciences*, *2*(4), 170.

Hacıseferoğulları, H., Özcan, M., Demir, F., & Çalışır, S. (2005). Some nutritional and technological properties of garlic (Allium sativum L.). *Journal of food engineering*, *68*(4), 463-469. https://doi.org/10.1016/j.jfoodeng.2004.06.024

Kallel, F., Driss, D., Chaari, F., Belghith, L., Bouaziz, F., Ghorbel, R., & Chaabouni, S. E. (2014). Garlic (Allium sativum L.) husk waste as a potential source of phenolic compounds: Influence of extracting solvents on its antimicrobial and antioxidant properties. *Industrial Crops and Products*, *62*, 34-41. https://doi.org/10.1016/j.indcrop.2014.07.047

Karimi, A., Yan, F., Coto, C., Park, J. H., Min, Y., Lu, C., ... & Waldroup, P. W. (2010). Effects of level and source of oregano leaf in starter diets for broiler chicks. *Journal of Applied Poultry Research*, *19*(2), 137-145. https://doi.org/10.3382/japr.2009-00088

Khattak, F., Ronchi, A., Castelli, P., & Sparks, N. (2014). Effects of natural blend of essential oil on growth performance, blood biochemistry, cecal morphology, and carcass quality of broiler chickens. *Poultry science*, *93*(1), 132-137. https://doi.org/10.3382/ps.2013-03387

Kikusato, M. (2021). Phytobiotics to improve health and production of broiler chickens: functions beyond the antioxidant activity. *Animal Bioscience*, *34*(3), 345.

Le Bihan-Duval, E., Millet, N., & Rémignon, H. (1999). Broiler meat quality: effect of selection for increased carcass quality and estimates of genetic parameters. *Poultry Science*, *78*(6), 822-826. https://doi.org/10.1093/ps/78.6.822

Lisnanti, E. F., Qowim, N., & Fitriyah, N. (2019). Pengaruh Penambahan Ekstrak Sarang Semut (Myrmecodia sp) Terhadap Bobot Akhir, Persentase Lemak Abdominal dan Hati Ayam Broiler Fase Finisher. *TERNAK TROPIKA Journal of Tropical Animal Production*, *20*(2), 111-119.

Lutfiah, A., Adi, A. C., & Atmaka, D. R. (2021). Modifikasi Kacang Kedelai (Glycine Max) dan Hati Ayam Pada Sosis Ayam Sebagai Alternatif Sosis Tinggi Protein dan Zat Besi. *Amerta Nutrition*, *5*(1), 75.

Martins, N., Petropoulos, S., & Ferreira, I. C. (2016). Chemical composition and bioactive compounds of garlic (Allium sativum L.) as affected by pre-and post-harvest conditions: A review. *Food chemistry*, *211*, 41-50. https://doi.org/10.1016/j.foodchem.2016.05.029

Panou-Filotheou, H., Bosabalidis, A. M., & Karataglis, S. (2001). Effects of copper toxicity on leaves of oregano (Origanum vulgare subsp. hirtum). *Annals of Botany*, *88*(2), 207-214. https://doi.org/10.1006/anbo.2001.1441

Priolo, A., Micol, D., Agabriel, J., Prache, S., & Dransfield, E. (2002). Effect of grass or concentrate feeding systems on lamb carcass and meat quality. *Meat science*, *62*(2), 179-185. https://doi.org/10.1016/S0309-1740(01)00244-3

Schirrmacher, V. (2017). Immunobiology of Newcastle disease virus and its use for prophylactic vaccination in poultry and as adjuvant for therapeutic vaccination in cancer patients. *International Journal of Molecular Sciences*, *18*(5), 1103.

Simirgiotis, M. J., Burton, D., Parra, F., López, J., Muñoz, P., Escobar, H., & Parra, C. (2020). Antioxidant and antibacterial capacities of Origanum vulgare L. essential oil from the arid Andean Region of Chile and its chemical characterization by GC-MS. *Metabolites*, *10*(10), 414.

Suriani, N. L., & Darmadi, A. A. K. (2019). Utilization of biotechnology staters to improve quality and production of clove plant (syzygium aromaticum l). *International Journal of Life Sciences & Earth Sciences*, *2*(1), 38-43. https://doi.org/10.31295/ijle.v2n1.92

Umatiya, R. V., Srivastava, A. K., Pawar, M. M., Chauhan, H. D., & Jain, A. K. (2018). Efficacy of ginger (Zingiber officinale) and garlic (Allium sativum) powder as phytogenic feed additives in diet of broiler chickens. *Journal of Pharmacognosy and Phytochemistry*, *7*(3), 1136-1140.

Węglarz, Z., Kosakowska, O., Przybył, J. L., Pióro-Jabrucka, E., & Bączek, K. (2020). The quality of Greek oregano (O. vulgare L. subsp. hirtum (Link) Ietswaart) and common oregano (O. vulgare L. subsp. vulgare) cultivated in the temperate climate of central Europe. *Foods*, *9*(11), 1671.