

## PERKEMBANGAN PENELITIAN AFLATOKSIN DI INDONESIA DAN UPAYA PENURUNAN TOKSISITAS AFB<sub>1</sub> PADA BROILER

### INTISARI

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Penelitian dibagi menjadi tiga tahapan yang terdiri atas: 1) Perkembangan penelitian aflatoksin pada bidang peternakan di Indonesia dari tahun 1995-2020, 2) Tingkat pengetahuan dan kesadaran peternak broiler skala kecil terhadap cemaran aflatoksin di Daerah Istimewa Yogyakarta 3) Penurunan toksisitas aflatoksin B<sub>1</sub> (AFB<sub>1</sub>) pada broiler dengan penambahan metionin dalam pakan. Penelitian tahap pertama bertujuan untuk mengetahui perkembangan penelitian aflatoksin pada bidang peternakan di Indonesia. Total 77 publikasi yang terdapat di database Scopus dan Shinta digunakan dalam analisis *bibliometric* dan visualisasi. Analisis network penelitian menggunakan VOSviewer©. Hasil analisis menunjukkan bahwa penelitian aflatoksin dalam bidang peternakan di Indonesia masih terbatas, terutama penurunan dampak aflatoksin pada ternak. Berdasarkan database Scopus, publikasi tentang aflatoksin di Indonesia berjumlah 77 dokumen (1995-2020), di bawah Thailand dan Malaysia. Selain itu, tidak terdapat publikasi tentang sosial-ekonomi yang berhubungan dengan tingkat pengetahuan dan kesadaran peternak terhadap aflatoksin serta kerugian ekonomi yang disebabkan oleh aflatoksin di bidang peternakan. Penelitian yang banyak dilakukan yaitu pertumbuhan *Aspergillus flavus* dan survei tingkat cemaran aflatoksin pada produk pertanian dan pakan.

Penelitian tahap kedua bertujuan untuk mengetahui tingkat pengetahuan dan kesadaran peternak broiler di Daerah Istimewa Yogyakarta (DIY) terhadap cemaran aflatoksin serta mengukur kandungan AFB<sub>1</sub> pada pakan. Total 122 peternak broiler dari empat kabupaten di DIY dilibatkan dalam penelitian. Pengetahuan peternak terhadap cemaran aflatoksin dievaluasi menggunakan pertanyaan: *Apakah anda mengetahui cemaran aflatoksin pada pakan?* Empat puluh sampel pakan dikoleksi dari Gunungkidul (14), Bantul (7), Sleman (5), dan Kulon Progo (14) untuk diukur kandungan AFB<sub>1</sub>. Kadar AFB<sub>1</sub> pakan dianalisis menggunakan ELISA kit kemudian dibandingkan dengan batas maksimal SNI. Hasil penelitian menunjukkan bahwa 93,25% peternak tidak mengetahui aflatoksin. Meskipun peternak mengetahui penanganan jamur pada pakan dan memisahkannya, peternak dari Kabupaten Kulon Progo memiliki pengetahuan tertinggi (13,33%), sedangkan terendah di Kabupaten Bantul (0%). Peternak dengan jumlah kepemilikan ternak 3001 – 5000 ekor memiliki tingkat pengetahuan dan kesadaran lebih tinggi terhadap cemaran aflatoksin. Semua sampel pakan broiler di DIY tercemar AFB<sub>1</sub> melebihi batas maksimal SNI. Tingkat rata-rata cemaran AFB<sub>1</sub> mencapai 184,45 µg/kg. Level cemaran AFB<sub>1</sub> terendah di Kabupaten Sleman (79,59 µg/kg). Cemaran AFB<sub>1</sub> di daerah Kabupaten Kulon Progo, Kabupaten Gunungkidul, dan Kabupaten Sleman tidak menunjukkan perbedaan yang nyata dengan level AFB<sub>1</sub> berkisar antara 190,71 – 210,41 µg/kg.

Penelitian tahap ketiga bertujuan untuk mengetahui dampak penambahan metionin terhadap penurunan toksisitas AFB<sub>1</sub> pada broiler. Total 320 *day old chickens* (DOC) broiler *unsexed* ditempatkan dalam 40 kandang koloni. Setiap

perlakuan terdiri atas 8 ulangan, masing-masing ulangan terdapat delapan ekor broiler. Perlakuan dalam penelitian terdiri atas P0 (Kontrol, basal diet, tanpa penambahan AFB<sub>1</sub>), P1 (P0 + 100 µg/kg AFB<sub>1</sub>), P2 (P0 + 500 µg/kg AFB<sub>1</sub>), P3 (P0 + 100 µg/kg AFB<sub>1</sub> + 3 g/kg metionin), dan P4 (P0 + 500 µg/kg AFB<sub>1</sub> + 3 g/kg metionin). Pakan perlakuan diberikan pada broiler dari hari ke-8 sampai akhir penelitian (hari ke-35). Data yang diperoleh dianalisis menggunakan analisis variansi dan dilanjutkan dengan uji *contrast orthogonal*.

Hasil penelitian menunjukkan bahwa penambahan metionin dalam pakan meningkatkan produksi glutathione dan penurunan kerusakan hati. Cemaran AFB<sub>1</sub> menyebabkan hati berwarna lebih pucat dibandingkan perlakuan kontrol dan pakan tercemar AFB<sub>1</sub> dengan penambahan metionin. Histopatologi hati menunjukkan bahwa perlemakan dan aktivitas enzim (SGOT dan SGPT) menurun dengan penambahan metionin dalam pakan tercemar AFB<sub>1</sub>. Penambahan metionin dalam pakan tercemar AFB<sub>1</sub> berperan untuk mencegah perubahan biokimia darah, seperti protein, albumin, urea, kreatinin, asam urat, dan fosfat. Penambahan metionin dalam pakan tercemar AFB<sub>1</sub> memperbaiki pertumbuhan vili usus dan mencegah penurunan aktivitas enzim pada pankreas serta duodenum, sehingga meningkatkan pemanfaatan energi pakan. Aflatoksin B<sub>1</sub> menurunkan bobot badan dan indeks prestasi (IP) broiler serta meningkatkan FCR, meskipun tidak menyebabkan perubahan pada konsumsi pakan dan mortalitas. Penambahan metionin dapat mencegah penurunan bobot badan, memperbaiki konversi pakan (FCR), dan meningkatkan IP. Cemaran AFB<sub>1</sub> juga berpengaruh terhadap peningkatan lemak abdominal karkas dan kolesterol, serta menurunkan bahan kering dan protein daging. Cemaran AFB<sub>1</sub> dapat menurunkan kualitas fisik daging seperti pH, kadar air, susut masak, keempukan, dan daya ikat air. Penambahan metionin dalam pakan tercemar AFB<sub>1</sub> mencegah residu AFB<sub>1</sub> dalam daging dan hati.

Berdasarkan hasil penelitian yang dilakukan dapat disimpulkan bahwa penelitian aflatoksin pada bidang peternakan di Indonesia masih terbatas. Tingkat pengetahuan dan kesadaran peternak broiler terhadap cemaran aflatoksin di DIY masih rendah dan diikuti oleh cemaran AFB<sub>1</sub> pada pakan melebihi batas maksimal SNI. Penambahan metionin dapat meningkatkan produksi glutathione, menurunkan toksisitas dan residu AFB<sub>1</sub>, memperbaiki produktivitas serta mencegah penurunan kualitas daging broiler.

Kata kunci: Aflatoksin, Kesadaran peternak, Metionin, Toksisitas, Broiler

## STUDY AFLATOXIN RESEARCH TRENDS IN INDONESIA AND REDUCTION OF AFATOXIN B<sub>1</sub> TOXICITY IN BROILER

### ABSTRACT

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The research was divided into three studies: 1) Aflatoxin research trends of the livestock industry in Indonesian during 1995-2020, 2) Knowledge and awareness of small-scale broiler farmers to aflatoxin contamination in Special Region of Yogyakarta, 3) Effect of methionine to reduce aflatoxin B<sub>1</sub> (AFB<sub>1</sub>) toxicity in broilers. The first research aimed to determine the development of aflatoxin research of livestock industry in Indonesian. A total of 77 publications about aflatoxin based on the Scopus and Shinta index were used in bibliometric and visualization analysis. Network analysis of research word used the VOSviewer© software. The analysis showed that aflatoxin publication of livestock industry in Indonesian is still limited, especially aflatoxin detoxification in animal livestock. Based on the Scopus database, a number of aflatoxin publication in Indonesia is 77 documents, under Thailand and Malaysia. Besides, there were no publications on socio-economics related to the knowledge and awareness of aflatoxin contamination in livestock farmers and economic losses caused aflatoxin contamination in the livestock industry. The most publication was *Aspergillus flavus* growth and a survey of aflatoxin contamination in agriculture products and feed.

The second research was conducted to evaluate the level of knowledge and awareness of broiler farmers on aflatoxin and determine of AFB<sub>1</sub> level of feed in the the Special Region of Yogyakarta. A total of 112 small scale broiler farmers were interviewed from four districts in the Special Region of Yogyakarta. The awareness of aflatoxins was evaluated by a question: *Have you heard about aflatoxins?* A total of 40 feed samples were collected from Gunungkidul (14), Bantul (7), Sleman (5), and Kulon Progo (14) to measure AFB<sub>1</sub> level by ELISA kit then compared with the Indonesia Standard (SNI). The result showed that 93,5% of farmers did not know about aflatoxins. However, the farmers knew the management of fungi contamination in poultry feed and shorted. Farmers from Kulon Progo had the highest knowledge about aflatoxin contamination (13.33%) and Bantul was the lowest (0%). The number of broiler ownerships (3001-5000 birds) affected the farmer's knowledge and awareness in aflatoxin contamination. All the broiler feed samples were contaminated with AFB<sub>1</sub> more than the Indonesian Standard (50 µg/kg). The average of AFB<sub>1</sub> contamination was 184.45 µg/kg. Sleman was the district with the lowest AFB<sub>1</sub> contamination (79.59 µg/kg). AFB<sub>1</sub> contamination in Kulon Progo, Gunungkidul, and Bantul did not differ, with AFB<sub>1</sub> level from 190.71 to 210.41 µg/kg.

The objective of the third study was to determine the effect of methionine supplementation to reduce AFB<sub>1</sub> toxicity in broilers. Total 320 day old unsexed broiler were divided into 5 dietary treatments with 8 replicates, eight birds per replicate. The treatments were as follows P0: control (basal diet, without AFB<sub>1</sub>), P1: P0 + 100 µg/kg AFB<sub>1</sub>, P2: P0 + 500 µg/kg AFB<sub>1</sub>, P3: P0 + 100 µg/kg AFB<sub>1</sub> + 3 g/kg methionine, P4: P0 + 500 µg/kg AFB<sub>1</sub> + 3 g/kg methionine. The dietary

treatments were given to broilers from day 8 until day 35. Data obtained were analyzed using variance and continued analysis with contrast orthogonal tests.

The results showed that the supplementation of methionine increased glutathione production and reduced liver damage. A slight coloration was shown in the liver of broiler fed AFB<sub>1</sub> without methionine addition. Liver histopathology showed that AFB<sub>1</sub> treatment with supplementation of methionine reduced fatty and enzyme activity (SGOT and SGPT) in. The addition of methionine reduced blood biochemical changes in protein, albumin, urea, creatinine, uric acid, and phosphate. Methionine ameliorated the growth of intestinal villus and enzyme activity in the pancreas and duodenum. It also increased the utilization of feed energy (AME). Aflatoxin B<sub>1</sub> decreased the body weight, FCR, and broiler index (IP), even though it did not significantly differ on feed consumption and mortality. Supplementation of methionine in AFB<sub>1</sub> contamination feed improved body weight, reduced feed conversion, and increased IP. The contamination of AFB<sub>1</sub> increased abdominal fat and cholesterol. Also, reduced dry matter, protein pH, water content, cooking losses, tenderness, and water holding capacity of meat. The addition of methionine reduced AFB<sub>1</sub> residues in the liver and meat.

In conclusion, publications about aflatoxin on the livestock industry in Indonesia were limited. Knowledge and awareness of broiler farmers on aflatoxin contamination were still low that followed by the level of AFB<sub>1</sub> contamination in feed exceeds the maximum limit of SNI. Supplementation of methionine increased glutathione production reduced the toxicity and residues of AFB<sub>1</sub>, improved the broiler productivity, and improved the meat quality.

**Keywords:** Aflatoxin, Farmer awareness, Methionine, Toxicity, Broiler