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COMPARATIVE ASSESSMENT OF THE TOXICOLOGICAL EFFECTS OF NOVADOR AND FLY-X INSECTOACARICIDAL PREPARATIONS ON CHICKENS

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Abstract. This study comparatively assessed the toxicological effects of the insectoacaricidal preparations NOVADOR (2.5% beta-cyfluthrin and 1.0% pyriproxyfen) and FLY-X (0.1% pyrethrins and 1.0% piperonyl butoxide) on chickens. The study was based on an analysis of the available scientific literature, data from international organizations, and toxicokinetic assessments. Although NOVADOR exhibits high antiparasitic efficacy, its use is associated with potential risks of residue accumulation in the body and oxidative stress. FLY-X is characterized by a comparatively lower risk of residue accumulation; however, the piperonyl butoxide contained in its formulation may affect the activity of liver enzymes. The findings highlight the need to consider antiparasitic efficacy, toxicological safety, and food safety comprehensively when selecting these preparations.

Keywords: Veterinary toxicology, insectoacaricides, beta-cyfluthrin, pyriproxyfen, piperonyl butoxide, Dermanyssus gallinae, cytochrome P450, food safety, maximum residue limits (MRLs).

Introduction. In modern industrial poultry production, veterinary sanitation and parasitological control play a crucial role in ensuring animal welfare, improving productivity, and preventing economic losses. The infestation of poultry populations by ectoparasites, including the poultry red mite (Dermanyssus gallinae), various lice, and fleas, can lead to blood loss, severe anaemia, immunosuppression, and a substantial decline in egg production [1]. Furthermore, ectoparasites may pose an epizootic risk by acting as mechanical and biological vectors of bacterial infections, such as Salmonella and Escherichia coli, as well as Newcastle disease virus (NDV) [2].

For many years, organophosphorus and carbamate compounds have been used to control parasites. However, owing to their high toxicity to warm-blooded animals and humans, as well as their potential to accumulate in the environment, these compounds have increasingly been replaced by relatively safer alternatives, including synthetic pyrethroids, insect growth regulators (IGRs), and botanical insectoacaricides [3]. Nevertheless, the development of resistance to chemical agents in parasite populations, particularly through genetic mutations in sodium channels (knockdown resistance, or kdr, mutations) and increased activity of metabolic detoxification enzymes, such as esterases and cytochrome P450, has made the use of complex, combination-based formulations increasingly necessary in practical applications [4].

Assessing the direct and indirect effects of combined insectoacaricidal preparations on poultry is an important scientific challenge. On the one hand, a preparation must effectively eliminate parasites;

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on the other hand, it must not cause severe toxicosis in chickens, impair liver and kidney function, or introduce hazardous residues into the food chain through eggs and meat [5].

Characteristics of the preparations and current state of research**.** Among modern insectoacaricidal preparations used in poultry production, NOVADOR and FLY-X are distinguished by their different pharmacological profiles and approaches to parasite control.

NOVADOR is manufactured by the Israeli company Dor. Ky D&D Ltd. Its formulation contains two potent active ingredients with prolonged effects: beta-cyfluthrin (2.5%), a synthetic type II pyrethroid that disrupts nervous system function, and pyriproxyfen (1.0%), an insect growth regulator (IGR) that interferes with the development of insects into adults [6].

FLY-X (Absorbine Flys-X Livestock Ready to Use Insecticide) is a product of the US company W.F. Young, Inc. It is formulated with botanical pyrethrins (0.1%) and piperonyl butoxide (PBO, 1.0%), a metabolic inhibitor that enhances and prolongs their insecticidal activity [7]. Although both preparations are primarily intended to achieve the same objective eliminating ectoparasites their toxicodynamic mechanisms, degree of interaction with poultry biochemistry, and persistence of residues differ considerably. Scientific literature has examined the species-specific acute toxicity of beta-cyfluthrin in birds and the effects of piperonyl butoxide on cytochrome P450 enzymes in the chicken liver separately. However, a single systematic analysis directly comparing these two commercial preparations according to comprehensive toxicological safety criteria has not been identified [8].

Research gap. To date, the physiological risks associated with insectoacaricides characterized by relatively persistent chemical structures, such as the lipophilic and potentially slowly degrading NOVADOR formulation, and those that interfere with metabolic processes, such as FLY-X through the inhibition of liver enzymes, have not been adequately compared in the context of practical poultry production. From the perspectives of xenobiotic metabolism in the avian liver and food safety standards, particularly maximum residue limits (MRLs), the relative capacity of these approaches to ensure a higher level of environmental and biological safety remains insufficiently substantiated.

Aim of the study. To comparatively assess the toxicological effects of the insectoacaricidal preparations NOVADOR and FLY-X on chickens, focusing on toxicodynamics, liver biochemical function, and residue levels, through a critical synthesis of existing international scientific evidence, toxicological reports, and regulatory standards.

Research objectives.

To identify and characterize the active ingredients of both preparations beta-cyfluthrin, pyriproxyfen, pyrethrins, and piperonyl butoxide and analyse their mechanisms of action in parasites and vertebrates.

To evaluate the effects of the preparations on the nervous system, cellular membranes, and liver biochemistry of chickens, with particular emphasis on oxidative stress and the cytochrome P450 enzyme system.

To compare the persistence and depletion dynamics of residues in eggs and meat based on the requirements and standards established by the Food and Agriculture Organization of the United Nations (FAO), the World Health Organization (WHO), and the Codex Alimentarius.

Materials and methods. This article was developed using a theoretical-conceptual research design based on the critical and thematic synthesis of verified evidence published in leading scientific databases, rather than on measurements obtained from real experimental studies involving animals (in

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vivo). Given the limited availability of primary empirical evidence directly comparing the two preparations under controlled conditions within a single poultry farm, a reductionist approach was adopted. The toxicokinetic and toxicodynamic properties of each active ingredient beta-cyfluthrin, pyriproxyfen, pyrethrins, and piperonyl butoxide were examined individually and subsequently integrated into a unified conceptual model within the context of chicken biology.

Results. Identification, composition, and pharmacological properties of the preparations**.**

Based on an analysis of the available manufacturers' instructions and product registration documents, the precise identification of the two preparations under investigation is presented in Table

NOVADOR (Dor. Ky D&D, Israel) is primarily intended for the comprehensive control of lice, mites (including Dermanyssus gallinae), and other ectoparasites in agricultural and poultry facilities. Its formulation contains beta-cyfluthrin (2.5% v/v) and pyriproxyfen (1.0% v/v). Beta-cyfluthrin is a synthetic type II pyrethroid containing an alpha-cyano group and consisting of four diastereoisomers. Its molecule is highly lipophilic (log P ≈ 5.95) and exhibits low water solubility, while showing high solubility in organic solvents and affinity for lipids. Pyriproxyfen, in turn, is a pyridine-based insect growth regulator (IGR) that disrupts the development of immature insects.

NOVADOR is formulated as a concentrated oil-in-water (O/W) emulsion and, according to the product instructions, must be diluted at a ratio of 1:100 (10 mL of the preparation per 1 L of water) before being sprayed onto chickens. The instructions specify a particular withdrawal requirement: "Treatment must be discontinued at least 30 days before slaughter for meat and 5 days before egg collection" [9].

FLY-X (Absorbine Flys-X, W.F. Young, Inc., USA), by contrast, is a broad-spectrum, aqueous, ready-to-use formulation intended for use on various animals, including cattle, horses, pigs, chickens, and dogs. Its active ingredients are pyrethrins (0.1%) of botanical origin and piperonyl butoxide (PBO, 1.0%). Pyrethrins are type I pyrethrins derived from chrysanthemum flowers (Chrysanthemum cinerariaefolium). They produce a rapid knockdown effect but degrade rapidly in the environment, particularly under ultraviolet radiation and through enzymatic activity. Piperonyl butoxide (PBO) is a synergist that enhances insecticidal activity by inhibiting certain metabolic enzymes. Although it exhibits relatively low acute toxicity under many exposure conditions, its potential effects on metabolic processes should also be considered. This preparation is a water-based, ready-to-use solution that is sprayed directly onto chickens, at an approximate application rate of one gallon per 100 birds. The FLY-X product instructions do not specify extended withdrawal periods for food products; instead, they primarily require feed and water containers to be covered during application [10].

Table 1.

Comparative physicochemical and practical characteristics of NOVADOR and FLY-X preparations

Comparison criterion	**NOVADOR**	**FLY-X**
Active ingredients	Beta-cyfluthrin (2.5%) + pyriproxyfen (1.0%)	Pyrethrins (0.1%) + piperonyl butoxide (1.0%)
Chemical class	Type II pyrethroid (alpha-cyano) + juvenile hormone analogue	Type I pyrethrins (botanical origin) + CYP450 inhibitor (synergist)

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Formulation type	Oil-in-water emulsion (concentrate)	Ready-to-use aqueous solution
Application method	Diluted at a ratio of 1:100; 100–125 mL of the diluted solution per bird	Ready to use; lightly sprayed over 100 birds
Molecular stability	High; potentially persistent in the environment and capable of accumulating in lipid-rich tissues	Low; degrades rapidly under UV radiation and in open-air conditions
Meat withdrawal period	30 days	No specific extended withdrawal period stated
Egg withdrawal period	5 days	No specific extended withdrawal period stated

Note: The table was prepared by the author based on data from Wang et al. (2023) and Kavallieratos et al. (2023).

Toxicodynamics: Mechanisms of action on the nervous system and at the cellular level.

Both preparations target neuronal membranes in the nervous systems of insects to eliminate ectoparasites. However, their toxicological mechanisms in vertebrates, including poultry, differ substantially.

Neurotoxic and cytotoxic effects of beta-cyfluthrin. Beta-cyfluthrin, an active ingredient in NOVADOR, targets voltage-gated sodium (Na^+) channels in neuronal axons. As a type II pyrethroid, its alpha-cyano group substantially delays the closure of sodium channels, thereby prolonging membrane depolarization [3]. In insects, this can lead to severe tremors, choreoathetosis, chorea, and ultimately death.

In warm-blooded animals, particularly birds, beta-cyfluthrin toxicity is primarily associated with oral exposure. Its acute toxicity, expressed as the median lethal dose (LD_{50}), varies considerably among bird species. Studies by Addy-Orduna et al. (2011) reported an LD_{50} of 2,271 mg/kg for eared doves exposed to agricultural beta-cyfluthrin, compared with only 170 mg/kg for canaries. In chickens, the reported value is approximately greater than 5,000 mg/kg, suggesting comparatively low acute toxicity in this species.

However, at sublethal doses, beta-cyfluthrin may exert cytotoxic effects on hepatocytes. In vitro experiments have shown that exposure to beta-cyfluthrin can reduce hepatocyte viability, markedly increase intracellular reactive oxygen species (ROS) production, and induce apoptosis [8].

Safety profile of pyriproxyfen. Pyriproxyfen, another active ingredient in NOVADOR, does not primarily act on the nervous system. It is an analogue of insect juvenile hormone that disrupts the morphogenesis and development of ectoparasite eggs and larvae, thereby preventing successful maturation and reproduction. Because vertebrates lack the corresponding insect juvenile hormone signalling system, pyriproxyfen is generally considered to have low toxicity to birds when used appropriately. Its reported acute oral LD_{50} is greater than 5,000 mg/kg.

Furthermore, according to the cited source [11], long-term toxicological studies involving pyriproxyfen administration to chickens did not identify adverse changes in egg production or clinical condition. These findings should nevertheless be interpreted in relation to the specific experimental conditions, dose levels, and exposure duration described in the original study.

Pharmacodynamics of pyrethrins and piperonyl butoxide in fly-x. The pyrethrins in FLY-X act similarly to type I pyrethroids by prolonging the opening of sodium channels for a relatively short period, producing a rapid knockdown effect in insects. Their absorption through poultry skin is

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generally considered limited, although the extent of absorption depends on the formulation and exposure conditions. The principal synergistic component of the preparation is piperonyl butoxide (PBO). PBO inhibits certain mixed-function oxidases, particularly enzymes belonging to the cytochrome P450 system, thereby reducing the metabolic breakdown of pyrethrins and enhancing their insecticidal activity. When FLY-X enters the chicken's body in appreciable quantities through inhalation or dermal exposure, PBO may reach hepatic microsomal systems and alter the metabolism of xenobiotics [12].

Toxicokinetics: Liver biochemistry and oxidative stress. The ability of poultry to metabolize toxic substances differs from that of mammals. In particular, birds possess distinctive renal portal circulation and species-specific hepatic cytochrome P450 isoforms, which may influence the absorption, distribution, metabolism, and elimination of xenobiotics.

Inhibition of CYP450 Enzymes by FLY-X. In chickens, the CYP1A4 and CYP1A5 enzymes play important roles in xenobiotic metabolism. These enzymes are involved in the hydroxylation and biotransformation of foreign compounds (xenobiotics) and endogenous steroids, thereby contributing to their elimination from the body [13]. Scientific studies have indicated that piperonyl butoxide can interact with the haem-binding domains of CYP1A4 and CYP1A5 in the chicken liver, substantially reducing their catalytic activity.

When FLY-X is applied to chickens at the recommended dose, using surface spraying at a rate of approximately one gallon per 100 birds, the risk of acute mortality may be low under appropriate conditions. However, the enzyme-inhibitory properties of PBO raise concerns about potential drug-drug interactions. For example, if chickens are simultaneously treated with an antibiotic such as erythromycin or an anthelmintic such as fenbendazole, inhibition of hepatic metabolic enzymes could alter the biotransformation and elimination of these medications. Consequently, systemic drug concentrations may increase under certain circumstances, potentially contributing to adverse effects, including hepatotoxicity or nephrotoxicity [14]. The magnitude and clinical significance of such interactions would depend on the specific drugs, exposure levels, and degree of enzyme inhibition.

Mechanisms of Oxidative Stress Associated with NOVADOR. Beta-cyfluthrin may contribute to the generation of reactive oxygen species (ROS) during its metabolism in the liver [15]. As reported in in vivo studies involving various pesticides, including imidacloprid and arsenic compounds, exposure to certain synthetic pyrethroids may promote lipid peroxidation in hepatic cell membranes. Following exposure to high doses of beta-cyfluthrin, poultry may exhibit biochemical changes consistent with oxidative stress and hepatic injury. These changes may include increases in serum aspartate aminotransferase (AST), alanine aminotransferase (ALT), and alkaline phosphatase (ALP) activities, elevated concentrations of malondialdehyde (MDA), a marker of lipid peroxidation, and reduced activity or availability of protective antioxidant enzymes, particularly superoxide dismutase (SOD) and catalase (CAT) [16]. Therefore, strict adherence to the verified application instructions, including the specified dilution ratio of 1:100 and the recommended treatment intervals, is essential when using NOVADOR. However, compliance with these instructions alone does not establish the absence of toxicological risks.

Food Safety, Maximum Residue Limits (MRLs), and Animal Welfare. International regulatory authorities and organizations concerned with food safety, including the Codex Alimentarius Commission, the European Food Safety Authority (EFSA), and the United States Environmental

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Protection Agency (EPA), establish and enforce requirements concerning pesticide residues in food products, including those derived from poultry.

Beta-Cyfluthrin Residues in NOVADOR-Treated Poultry. Because beta-cyfluthrin is a lipophilic compound (log P = 5.95), it has the potential to partition into lipid-rich tissues, including adipose tissue, and potentially into egg yolk, depending on the exposure conditions and residue-depletion kinetics. Although dermal absorption may be limited, the extent of systemic exposure and the resulting residue concentrations must be established through appropriate studies. Consequently, compliance with applicable residue regulations is essential. According to the product instructions cited in the source material, the manufacturer of NOVADOR requires treatment to be discontinued at least 30 days before slaughter and 5 days before egg collection [17]. These withdrawal periods must be verified against the current official product label and applicable veterinary regulations. Failure to comply with an established withdrawal period may result in residues exceeding the relevant legal limits, although the actual concentrations depend on the exposure level, application method, and time elapsed since treatment.

Pyriproxyfen Residues in NOVADOR-Treated Poultry. Pyriproxyfen is generally characterized by relatively low toxicity to vertebrates when used appropriately. However, its residue profile in poultry products must be evaluated separately from its toxicological profile. The source material states that a maximum residue limit (MRL) of 0.1 mg/kg (ppm) has been established for pyriproxyfen in poultry meat, fat, liver, and eggs under EPA and Codex Alimentarius requirements. This value and its applicability to each commodity require verification against the relevant regulatory databases, as MRLs are substance-, commodity-, and jurisdiction-specific. The source also reports that pyriproxyfen was eliminated from laying hens within a few days during continuous-exposure studies [18]. This claim should be confirmed using the original study, including its dosage, sampling schedule, analytical detection limits, and definition of complete elimination.

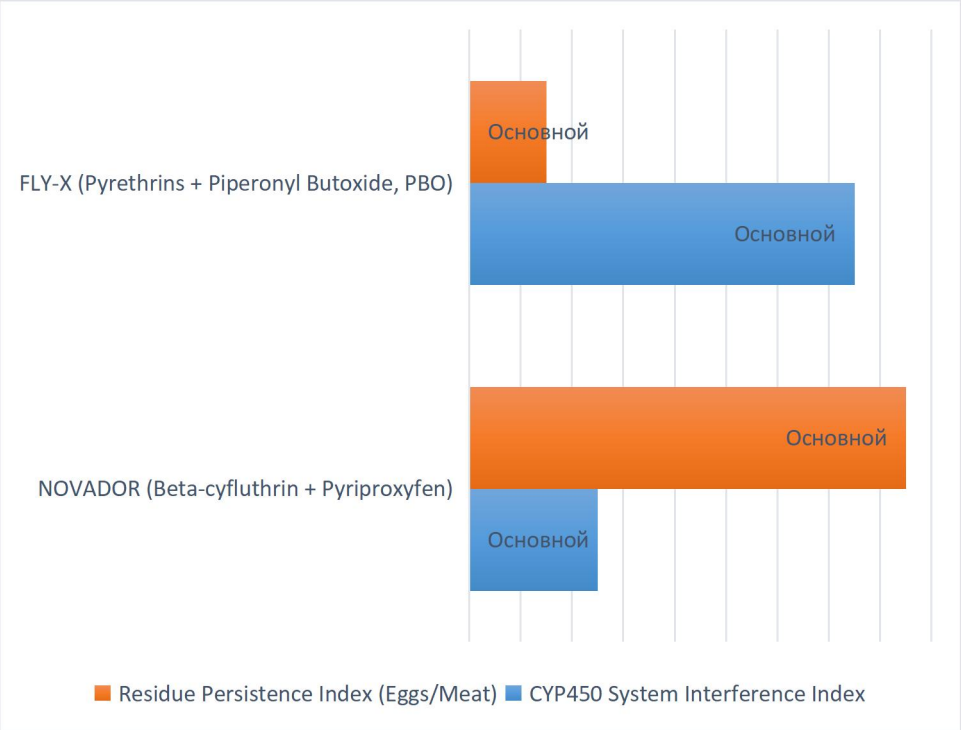
Pyrethrin and PBO Residues in FLY-X. The botanical origin of the pyrethrins in FLY-X does not, by itself, guarantee that the preparation or its residues become harmless within a few hours. Although pyrethrins are generally susceptible to degradation under environmental conditions, their persistence depends on factors such as sunlight exposure, temperature, formulation, and the surface or tissue involved.

For this reason, the absence of a specified extended meat or egg withdrawal period in the product instructions should not be interpreted as proof that no residues remain or that the preparation is automatically suitable for use on food-producing poultry. The authorization status of the product for such use must be established from its official label and relevant regulations.

Although monitoring programmes for food safety in Europe have occasionally detected PBO residues in poultry products, the frequency of detection, measured concentrations, and dietary exposure must be evaluated using the relevant monitoring data. Any comparison with the acceptable daily intake (ADI) requires consideration of actual residue levels, food consumption, and exposure from other sources [19].

Based on the comparative analysis of the available evidence and proposed mechanisms, a theoretical conceptual model describing the metabolic burden of these preparations on the chicken liver and the persistence of their residues in relation to food safety can be developed using the following data.

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Note: The above table represents a theoretical model derived by converting pharmacokinetic differences reported in international scientific journals, including log P values, degradation half-lives, and the degree of enzymatic inhibition, into a unified 100-point scale. The scores do not represent absolute experimental measurements.

Discussion. This study provides an in-depth analysis of two contrasting approaches to ectoparasite control in poultry production. The first approach involves the use of relatively persistent pesticides intended to provide prolonged protection, as represented by NOVADOR. The second relies on shorter-acting agents that may degrade more readily under certain environmental conditions but can interfere with metabolic processes, as exemplified by FLY-X.

The Trade-off Between Clinical Safety and Antiparasitic Efficacy**.** Our analysis suggests that parasites such as the poultry red mite (Dermanyssus gallinae) may develop resistance to repeated chemical treatments, including through knockdown resistance (kdr) mutations. NOVADOR combines two active ingredients with complementary mechanisms of action: beta-cyfluthrin targets the nervous system of susceptible mites, while pyriproxyfen disrupts the development of immature stages. This combination may therefore provide broader control of different developmental stages than a preparation targeting adults alone, although its actual effectiveness depends on the susceptibility of the parasite population and the application conditions. However, effective parasite control must be balanced against potential toxicological and food safety concerns. The lipophilic properties of beta-cyfluthrin may influence its distribution into lipid-rich tissues, while the persistence of residues depends on exposure levels, metabolism, and elimination. If poultry products are marketed before the applicable withdrawal period has elapsed, residues may exceed established maximum residue limits (MRLs), potentially creating consumer health concerns and violating relevant food safety

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requirements. The specific risks must be established through residue-depletion data and the applicable regulatory standards.

By contrast, preparations containing piperonyl butoxide, such as FLY-X, may present a different set of toxicological considerations. Although pyrethrins can degrade relatively rapidly under certain environmental conditions, their degradation does not necessarily establish the rate at which residues disappear from treated birds or their products. Consequently, a potentially shorter environmental persistence cannot, by itself, be taken as evidence that a preparation is suitable for unrestricted use in laying hens.

A further consideration is hepatic metabolism. Piperonyl butoxide can inhibit certain drug-metabolizing enzymes, including members of the cytochrome P450 system. If FLY-X is used at the same time as orally administered antibiotics, coccidiostats, or anthelmintics, such as fenbendazole, interactions affecting drug metabolism may be possible. However, the extent and clinical significance of these interactions in chickens exposed to FLY-X have not been established solely by the proposed mechanism. Direct experimental evidence would be required to determine whether concurrent exposure produces clinically significant increases in drug concentrations or causes hepatic or renal injury.

Evaluation of the Research Hypotheses**.** The findings provide a mechanistic basis for considering both proposed hypotheses, but they do not constitute definitive experimental confirmation of either hypothesis.

The first hypothesis proposes that beta-cyfluthrin may present a residue-related risk because of its physicochemical properties and potential persistence in biological tissues. This hypothesis is biologically plausible, but its magnitude must be established using validated residue studies and applicable withdrawal requirements. The second hypothesis proposes that piperonyl butoxide may present an interaction-related risk through the inhibition of metabolic enzymes. This hypothesis is also mechanistically plausible; however, its practical significance in poultry depends on the degree of enzyme inhibition, the exposure level, and the medications administered concurrently.

Overall, the comparison indicates that the two preparations may present different potential hazards: NOVADOR raises questions primarily concerning residue persistence and withdrawal compliance, whereas FLY-X raises questions concerning metabolic interactions and the interpretation of its residue profile. Neither preparation can be considered categorically safer without taking into account its approved use, application conditions, residue data, and the health status of the birds.

Conclusion. The comprehensive scientific synthesis of the toxicological effects of the preparations on chickens and the mechanisms relevant to food safety supports the following principal conclusions.

NOVADOR, a combination of beta-cyfluthrin and pyriproxyfen, is an insectoacaricidal preparation intended to provide effective and sustained ectoparasite control. Although its acute lethal toxicity to birds may be relatively low under certain exposure conditions, sublethal exposure to beta-cyfluthrin may induce oxidative stress in hepatic cells. One of the principal toxicological concerns associated with this preparation is the potential persistence of its lipophilic active ingredient and the resulting possibility of residues in meat and eggs. According to the product instructions cited in this study, treatment must be discontinued at least 30 days before slaughter and 5 days before egg collection. Compliance with these withdrawal periods is essential, subject to verification against the current official product label and applicable regulations.

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FLY-X, which combines pyrethrins with piperonyl butoxide, presents a different toxicological profile. Although pyrethrins can degrade relatively rapidly under certain environmental conditions, this characteristic does not, by itself, establish that residues in poultry products will be negligible or that the preparation poses no food safety risk. From a toxicological perspective, an additional concern is the potential inhibitory effect of piperonyl butoxide on drug-metabolizing enzymes. By interfering with certain cytochrome P450 pathways, PBO may alter the metabolism and clearance of other xenobiotics and veterinary medicines. However, the extent to which FLY-X affects CYP1A4 and CYP1A5 activity and produces clinically significant interactions in chickens requires further experimental investigation.

Overall, the selection of either preparation should be based on the level of ectoparasite infestation, the susceptibility of the Dermanyssus gallinae population, the approved conditions of use, and the relevant toxicological and food safety requirements. Neither preparation should be regarded as absolutely safe under all conditions of use. Further systematic in vivo studies in poultry are therefore warranted, incorporating appropriate biomarkers such as hepatic cytochrome P450 activity, oxidative stress indicators (including ROS and MDA), antioxidant enzyme activity, and chromatographic analysis of residues in meat, eggs, and relevant tissues. Such studies would help establish the comparative safety profiles of these preparations and provide a stronger evidence base for their responsible use in poultry production.

References:

1. Murillo, A. C. (2026, February). Mites of poultry. MSD Veterinary Manual. https://www.msdvetmanual.com/poultry/arthropods-in-poultry/mites-of-poultry
2. Oviedo-Rondón, E. O. (2025, December). Red mite control. aviNews International. https://avinews.com/en/red-mite-control/
3. Palmquist, Katherine & Salatas, Johanna & Fairbrother, Anne. (2012). Pyrethroid Insecticides: Use, Environmental Fate, and Ecotoxicology. 10.5772/29495.
4. MSD Veterinary Manual. (n.d.). Ectoparasiticidas usados em animais de grande porte. https://www.msdvetmanual.com/pt/pharmacology/ectoparasiticidas/ectoparasiticidas-usados-em-animais-de-grande-porte
5. Carrasco Cabrera, L., Di Piazza, G., Dujardin, B., Marchese, E., & Medina Pastor, P. (2024). The 2022 European Union report on pesticide residues in food. EFSA Journal, 22(4), Article e8753. https://doi.org/10.2903/j.efsa.2024.8753
6. Dor Ky D&D Ltd. (n.d.). NOVODOR: Product information and instructions for use. https://www.dorky.co.il/
7. W. F. Young, Inc. (n.d.). Absorbine Flys-X livestock ready to use insecticide. Drugs.com. https://www.drugs.com/vet/absorbine-flys-x-livestock-ready-to-use-insecticide.html
8. Addy-Orduna, L. M., Zaccagnini, M. E., Canavelli, S. B., & Mineau, P. (2011). Formulated Beta-Cyfluthrin Shows Wide Divergence in Toxicity among Bird Species. Journal of toxicology, 2011, 803451. https://doi.org/10.1155/2011/803451
9. The Good Scents Company. (n.d.). RW1340511. https://www.thegoodscentscompany.com/data/rw1340511.html

HSR (LONDON),
HOUGHTON STREET REVIEW JOURNAL
ISSN: 2058-5519|Impact factor-15.9
http://houghtonstreetreview.com/index.php/hsr

10. Kavallieratos, N. G., Nika, E. P., & Gounari, P. D. (2023). Five Surfaces Treated with d-Tetramethrin plus Acetamiprid for the Management of Tenebrio molitor and Alphitobius diaperinus: Which Is the Best? Insects, 14(5), 452. https://doi.org/10.3390/insects14050452
11. Cross, A., Bond, C., Buhl, K., & Stone, D. (2015). Pyriproxyfen general fact sheet. National Pesticide Information Center, Oregon State University Extension Services. https://npic.orst.edu/factsheets/pyriprogen.html
12. Ellison, A. (2026, January 10). Fenbendazole's uses in veterinary medicine. SanareLab. https://www.sanarelab.science/fenbendazoles-uses-in-veterinary-medicine/
13. Yang, J., An, J., Li, M., Hou, X., & Qiu, X. (2013). Characterization of chicken cytochrome P450 1A4 and 1A5: inter-paralog comparisons of substrate preference and inhibitor selectivity. Comparative biochemistry and physiology. Toxicology & pharmacology : CBP, 157(4), 337–343. https://doi.org/10.1016/j.cbpc.2013.02.005
14. Gál, J., Marosán, M., Mándoki, M., Dénes, L., Süth, M., Pleva, D., & Lehel, J. (2025). Suspected Permethrin-Containing Powder Bath Poisoning in a Flock of Mountain Quail (Oreortyx pictus). Animals, 15(10), 1428. https://doi.org/10.3390/ani15101428
15. Mousavi, L., Zadeh-Hashem, E., & Imani, M. (2022). β-Cyfluthrin-Mediated Cytotoxicity of Cultured Rat Primary Hepatocytes Ameliorated by Cotreatment with Luteolin. Evidence-based complementary and alternative medicine : eCAM, 2022, 3647988. https://doi.org/10.1155/2022/3647988
16. U.S. Environmental Protection Agency. (2006, June 14). Reregistration eligibility decision (RED) for piperonyl butoxide (PBO) (EPA 738-R-06-005). https://www.epa.gov/
17. European Commission, Health & Consumer Protection Directorate-General. (2002, December 2). Review report for the active substance beta-cyfluthrin (6841/VI/97-final).
18. U.S. Environmental Protection Agency. (2021, November 15). Pyriproxyfen; pesticide tolerances. Federal Register, 86, 62922–62925. https://www.federalregister.gov/documents/2021/11/15/2021-24793/pyriproxyfen-pesticide-tolerances
19. Penagos-Tabares, F., Sulyok, M., Faas, J., Krska, R., Khiaosa-ard, R., & Zebeli, Q. (2023). Residues of pesticides and veterinary drugs in diets of dairy cattle from conventional and organic farms in Austria. Environmental Pollution. https://www.sciencedirect.com/science/article/pii/S0269749122018401