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Analysis of multi-residue pesticides content in Oriens®Premium Garlic and its safety validation

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Abstract
Pesticides are widely used in agricultural production to prevent or control pests, diseases, and other plant pathogens in an effort to reduce or eliminate yield losses and maintain high product quality. Natural extracts, besides it's sought after pharmacological effect and uses in medical treatment, could be dangerous because of heavy metals and pesticides. The aim of this study is to investigate and detect the pesticide content in our Oriens® Premium Garlic product to ensure safety. In this study, the pesticides content were determined by QuEChERS method. The results were compared with the FSSAI safety limits and were found to be within the permissible limits. This study highlight that the pesticide content of manufacturing capsule does not exceed the safety limits and its concentration is far below the permissible limits, thus ensuring safety.

Keywords: pesticides, nutraceuticals, oriens® premium garlic, QuEChERS

Introduction
Pesticides are widely used in agricultural production to prevent or control pests, diseases, weeds, and other plant pathogens in an effort to reduce or eliminate yield losses and maintain high product quality (Christos *et al.* 2011). However, their excessive use or misuse especially in the developing countries, their volatility, long-distance transports eventually results in widespread environmental contamination. In addition many older, non-patented, more toxic, environmentally persistent and inexpensive chemicals are used extensively in developing nations, creating serious acute health problems and local and global environmental impacts (Ecobichon, 2001) [3].

The presence of harmful pesticide residues in food has caused a great concern among the consumers. Hence, world over to tackle food safety issues, organic farming is being propagated (Winter and Davis, 2006) [8]. However, due to several socio-cultural and technical reasons, diffusion and acceptance of this approach among the farming community in developing countries like India has been very slow. It is important to address the concern of food safety through suitable processing techniques and appropriate storage that enhance food safety even in developing countries especially for the poor population which cannot afford the expensive organic food (Koushik, *et al.* 2008).

Pesticide interference during food processing is highly toxic to consumer health. Certain toxic or undesirable compounds can be formed in foods during their processing, such as during heating, baking, roasting, grilling, canning, hydrolysis or fermentation. Safe Food processing treatments such as washing, peeling, canning or cooking lead to a significant reduction of pesticide residues. Washing with water and various chemical solutions for domestic and commercial use are necessary to decrease the intake of pesticide residues. Freezing as well as juicing and peeling are necessary to remove the pesticide residues in the skins (Koushik *et al.* 2009).

There is a need to optimize the processing techniques with regard to pesticide residue dissipation and nutrient content. Substantial attention needs to be focused on addressing optimization of the processing techniques in a manner that leads to considerable pesticide residue dissipation but preserves most of the essential food nutrients (Baker *et al.* 2002) [2].

The proper manufacturing of nutraceuticals under required cGMPs (Current Good Manufacturing Practices) will definitely increase the credibility of the products, as well as prove the safety of these products for the consumers (Pathak, 2010) [7]. Hence, to protect consumer health, Food Safety and Standards Authority of India, established safety limits for pesticide residues present in food to prevent the marketing of food containing residues under the Food Safety and Standards Act, 2006.

Thus the objective of this study is to analyse the pesticide content in our Oriens® Premium Garlicto ensure safety, quality and effectiveness.

Materials and methods
Methodology
Analysis of pesticides in Oriens® Premium Garlic
The analyses of pesticide residue were done for the formulated herbal product by Quick, Easy, Cheap, Effective, Rugged and Safe (QuEChERS) method.

Streamlined sample preparation approach, such as QuEChERS (Quick, Easy, Cheap, Effective, Rugged and Safe) was used, which required minimum extract clean-up and is the recent invention in the automated analytical method. This method included three steps

Step 1: Sample is prepared and extracted in this step and the commodities are homogenized.
Step 2: A subsample of the solvent extract is cleaned up using dispersive solid-phase extraction cleanup DSPE, a key improvement incorporated in the QuEChERS technique.
Step 3: In this step, the sample is analyzed by adjusting the pH to protect sensitive pesticides.
QuEChERS method is a convenient, rugged method that simplifies extract cleanup reduces material cost and improves sample throughout.

Detection Methods
Gas Chromatography-Tentative
Identification & Quantitative Measurement
Injected suitable aliquot (3–8 ml) of the concentratedeluate from Florisil or MgO–Celite column containing an amount of compound within linear range into gas chromatography, 970.52H, using 10 ml syringe.
Tentatively identified residue peaks on basis of retention times. Measured area or height of residue peak(s) and determined residue amount by comparison to peak area or height obtained from the known amount of appropriate reference material.

Results and Discussion
Oriens® Premium Garlic is a garlic extract compound. It contains Allicin has the active component. Oriens Premium Garlic is rich in antioxidant and increases efficiency of Immune system. It acts as a carminative and helps in the digestion. It also helps to prevent the respiratory infection. We aimed to study the pesticide content in *Premium garlic* capsules from Oriens Global Marketing (P) Ltd using the QuEChERS method.
Contamination of food commodities with trace amounts of pesticides has become a growing source of concern for the general population. The content of pesticides such as Aldrin, Cis-chlordane, Trans-chlordane, Heptachlor, Hexachlorobenzene, Dieldrin, Endosulfan, DDE, and DDT was determined in the Oriens® Premium Garlic. The analyzed values are presented in Table 1.

Table 1: Pesticides analysis in Oriens® Premium Garlic

Test Parameters	Sample - Oriens® Premium Garlic	FSSAI Limit
Pesticides (mg/kg) - Results		
Aldrin	BLQ	0.1
Cis-chlordane	BLQ	0.1
Trans-chlordane	BLQ	0.1
Heptachlor-epoxide	BLQ	0.01
Hexachloro-benezene	BLQ	0.02
Dieldrin	BLQ	0.1
Endosulfan	BLQ	2.0
p, p – DDE	BLQ	3.5
p, p - DDT	BLQ	3.5

*BLQ – Below Limit of Quantification

This study shows that there is no abnormal accumulation of pesticides like Aldrin, Dieldrin, cis-chlordane, Tran's chlordane, heptachlor, hexachloro benzene, endosulfan, DDE, DDT in the Oriens® Premium Garlic. The sample is found to be free from pesticidal residues due to natural sources like soil, air, water or waste water irrigation etc., and artificially due to machineries during the extraction process.
Pesticides are non-biodegradable and its bio-accumulation increases in health risks. Therefore developing countries are more prone to pesticide toxicity and its hazardous implications. However contamination of environment is fast increasing especially through the use of pesticides,for that reason many standards in food safety and control measures have been established, with limits and recommendations for permissible levels of pesticides. Here in our study it is observed that pesticide levels in the Oriens® Premium Garlic was assessed and were far below permissible limits.Thus periodic monitoring of pesticide residues in all herbal and nutraceutical products is essential and highly recommended to assess the temporal trends in human exposure to pesticides.

Conclusion
We found that this study shows no presence of pesticides contentlike Aldrin, Dieldrin, cis-chlordane, trans chlordane, heptachlor, hexachloro benzene, endosulfan, DDE, DDT in the *Oriens®Premium Garlic*.It represents that*Oriens® Premium Garlic*are found to be free from pesticides content. Therefore this study concludes that there is no possible health risk to humans due to pesticides to consume this product*Oriens® Premium Garlic*and it is said to be tested for safe consumption.

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