

## SOLUTION OF RESIDUE SUSPICION IN ORGANIC CUMIN AND ANISEED

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### Author's Background:

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### Summary:

*BIRLIK produce and export mostly organic aniseed, cumin and fennel. Other than these products, the company also produces poppy seed, ground oregano, thyme, sage, rosemary and chickpea in 7 different project areas. A research project is prepared between EU Agricultural Faculty Plant Protection Department and BIRLIK to solve the suspicion of occurrence of linuron and isoproturon herbicide metabolites formation in organic cumin and linuron formation in aniseed. This project was started in 2009 and samples were collected in different periods of time from organic and conventional farms and analyzed in Dr. Specht Laboratories. As a conclusion, a resembling metabolite of isoproturon metabolite is reviewed to be occurred close to and after harvest of cumin. The laboratory was informed about the results and the outcome was approved by their own studies.*

### Background:

BIRLIK produces mostly organic aniseed, cumin and fennel and extensively exports them. The number of producer companies that cooperate with increases day by day. Operation areas of the company include central and counties of Burdur, Konya, Tokat, Denizli, Balıkesir. There is a huge demand from the producer to start organic farming due to its higher income. However, there are some problems experienced also in organic farming. One of the leading problems is the pesticide residue suspicion in the products. BIRLIK prepared and concluded a project to solve these suspicions of occurrence of linuron and isoproturon herbicide metabolites formation in cumin and linuron formation in aniseed in Konya where BIRLIK has carried on export-oriented organic farming since 2006. The project associate farmer, industry and researcher and an important issue was solved by this cooperation.

### Main Chapter:

In this research, samples are collected from the linuron applied farms in Karayatakare in Üçkuyu/Sultandağı/Afyon where conventional aniseed and cumin farming are implemented. Cumin and aniseed samples are collected from a region in Pazaryolu area in Üçkuyu/Sultandağı/Afyon where no herbicide application exists.

Plant samples are collected from the conventional farms 10 and 24 days after linuron application, 10 days before harvest and after harvest when plant is getting dried. Seed and plant samples are taken at

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thelastperiodwiththesameamount.

Inparallelwiththis,

cuminandaniseedsamplesarecollectedfromtheorganicfarmswherenoherbicide is appliedfor 5 years. Allthesesamplesarepromptly sent toEurofins Dr. SpechtLaboratoriesforresidueanalysisandtheresultsareevaluated on ourpart.

Theresidueanalysisresults of linuronappliedaniseedareseen in Table-1. Inaniseed, themaximumresidue is determined (4,23 mg/kg) 10 daysafterlinuronapplication. However, thisleveldecreasedtozeroduringharvestanddrying. Linuronmetabolite, 3,4 dichloranilin, residue is measuredhigh in earlyperiodanddecreasedsubsequently. Isoproturonanditsmetabolitesare not detected in fourgrowthperiod of aniseed. Theresidueanalysisresults of theseherbicides in organicfarmingareseen in Table-2. As can be seen in Table-1, herbicideandtheirmetabolitesaremeasuredunderthe limit in allthreegrowthperiod of organicaniseed.

Theanalysisresults of linuronappliedcuminareseen in Table-3. Maximum residueamount (4,4 mg/kg) is measured 8 daysafterlinuronapplicationandthislevel is decreasedto 0,28 mg/kg duringdrying. Isoproturon is not detected in linuronappliedcumin but itsmetabolite, 4-isopropyl anilin, occurs 24 daysafterlinuronapplication. Although, theresidue of thesemetabolitesdecreased (0,07 mg/kg) duringdrying, theamountsareabovethelimits.

**Table 1.**Theresidueanalysisresultsafterlinuronapplication in aniseed in 4 differentperiod of time (mg/kg).

Active material	SamplingDate		
	30.05.2010 (10 <sup>th</sup> day)	13.06.2010 (24 <sup>th</sup> day)	23.07.2010 (BeforeHarvest)
Linuron	4.23	1.5	0.07
3-4 Dichloroanilin*	2.86	0.8	0.06
Isoproturon	0	0	0
4 Isopropylanilin**	0	0	0

\*Metabolite of Linuron

\*\*Metabolite of Isoproturon

\*\*\* 0 < LOQ (0.01 mg/kg)

**Table 2.**Theresidueanalysisresultsduringdifferentgrowingperiods of organicaniseed (mg/kg).

Active material	SampligDate	
	13.06.2010 (24 <sup>th</sup> day)	23.07.2010 (BeforeHarvest)
Linuron	0	0
3-4 Dichloroanilin*	0	0
Isoproturon	0	0
4 Isopropylanilin**	0	0

\*Metabolite of Linuron ,

\*\* Metabolite of Isoproturon

\*\*\* 0 < LOQ (0.01 mg/kg)

Theanalysisresults of organiccuminareseen in Table-4. Linuronanditsmetabolite 3,4 dichloranilinare not detected in threegrowingperiods of organiccumin. Again, isoproturonresidue is not measured in anyperiod. On theotherhand, whilethemetabolite of thisherbicideisopropylanilin is not detected in thefirstperiod, it is determinedabovethelimits (0,15-0,02 mg/kg) beforeandaftertheharvest. Thefirstsampling (24<sup>th</sup> day)

was made approximately 40 days after cumin germination in organic cumin farms. It is a conflict that a metabolite in the soil is not transferred to plant in this long period of time and later seen just before and during the harvest.

**Table 3.** The residue analysis results after linuron application in cumin in four different growing periods (mg/kg).

Active material	Sampling Date		
	23.05.2010 (8 <sup>th</sup> day)	08.06.2010 (24 <sup>th</sup> day)	25.06.2010 (Before Harvest)
Linuron	4.4	1.03	0.82
3-4 Dichloroanilin*	2.51	1.97	1.2
Isoproturon	0	0	0
4 Isopropylanilin**	0	0.15	0.2

\*Metabolite of Linuron

\*\*Metabolite of Isoproturon

\*\*\* 0 < LOQ (0.01 mg/kg)

**Table 4.** The residue analysis results of organic cumin in different growing periods (mg/kg).

Active Material	Sampling Date	
	08.06.2010 (24 <sup>th</sup> day)	25.06.2010 (Before Harvest)
Linuron	0	0
3-4 Dichloroanilin*	0	0
Isoproturon	0	0
4 Isopropylanilin**	0	0.15

\*Metabolite of Linuron

\*\*Metabolite of Isoproturon

\*\*\* 0 < LOQ (0.01 mg/kg)

Generally, systemic herbicides are transferred to plant in 3 weeks and these herbicide effects are considered in 3<sup>rd</sup> and 5<sup>th</sup> weeks after application. Furthermore, isoproturon is a herbicide that has no approval in Turkey (Anonymous, 2010). It is also a conflict to find a metabolite of a herbicide that is not approved in Turkey. Plus, in the world isoproturon is approved to be used in wheat but not in cumin (Anonymous, 2010). Moreover, it is stated that half-life (DT-50) of isoproturon in soil is 11-35 days (Navarro al. 2009).

### Core Messages and Conclusion

Linuron and its metabolite 3-4 dichloroanilin residues are at maximum levels 8 and 10 days after application in both aniseed and cumin farms. These levels decreased until drying period. Linuron and its metabolite are not detected in organic aniseed and cumin unsurprisingly (Table 2,4).

Isoproturon whose application is not approved in Turkey was not detected in both organic and conventional cumin and aniseed samples. However, the residue of this herbicide 4-isoproturon was found above the limits (0,2-0,02 mg/kg) close to and before harvest of organic and conventional cumin samples. Isoproturon and its metabolites are not detected in aniseed samples collected from the same location, (Table 1,2)

Detection of a herbicide or its metabolite, which are not approved and not used in cumin, is a big conflict. On the other hand, even if the presence of this herbicide in the soil is assumed, detection during harvest but not in the early periods of the plant is also confusing.

The results evaluated make us a conclusion that a resembling metabolite of isoproturon metabolite is possible to be occurred close to and after harvest of cumin. In fact, Eurofins Report (2012) points that isoproturon and its metabolites can be formed from natural structure of cumin. Whereas, in their previous reports (2010), it was reported that this herbicide and its metabolites residues are possible in cumin. The results of this research verify the Eurofins 2012 findings.

This research showed that unlicensed herbicide has no usage in cumin produced in our country and also proved a strong cooperation between farmer, company and university at the same time. Our farmers' support is of basic importance of this research's success.

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