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Opinion Article

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A Note on Possible Effects of *Satureja Khuzistanica* Essential Oils on Gammacoronavirus Genus

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Abstract

In almost all commercial and experimental broiler flocks, Infectious bronchitis (IB) is a major changing disease causing high mortality rate despite of practicing immunization programs. Excitingly, I observed low or even none mortality due to IB in the flocks or groups of broilers which received *Satureja khuzistanica* essential oils irrespective of the administration route compared with the corresponding control birds or flocks. I do encourage researches in medicinal plants filed to uncover the possible effects of *Satureja khuzistanica* essential oils on IB virus and other members of the Gammacoronavirus genus in the family Coronaviridae. This topic needs to receive much interest.

Key words: *Gammacoronavirus; Satureja khuzistanica; Infectious bronchitis virus*

Introduction

Beginning at 2008, since our research team initiated its educational programs with post graduate students, several research works have been conducted in our laboratory under my supervision on using *Satureja khuzistanica* essential oils in poultry nutrition. In fact, we concentrated our examinations on the same topic owing to the financial and technical support received from Khorraman Pharmaceutical Company, Khorramabad, Lorestan, Iran. We fed *Satureja khuzistanica* essential oils to many animal species mainly broiler chickens in different ages and through various routes form adding to water and feed to oral gavageing in doses ranging from 150 to 1000 mg (Khosravinia. 2013, 2015abcd). On the other hand, my experience in managing and visiting broiler flocks throughout the country over the same period of time, or even much more earlier, allows me to say that in almost all experimental as well as commercial broiler flocks, the birds were faced with Infectious bronchitis (IB) in ages varying from~14 to 42 days and with various intensities, despite of practicing immunization programs. In fact, I do agree all those scientists who reported IB is one of the major economically important poultry diseases distributed worldwide (Bande et al., 2016).

However, very interestingly I observed low or even none mortality rate in those flocks or groups of birds which received *Satureja khuzistanica* essential oils irrespective of the administration route compared with the corresponding control birds or flocks. In many cases, we observed no mortality in birds receiving *Satureja khuzistanica* essential oils while mortality was raised to about 10 percent in the corresponding control birds. Obviously, like almost all poultry nutrition researches we were not interested to analysis the

mortality causes and considered entire mortality as a productive performance parameter in our studies.

Opinion

The above-mentioned experiences, created a reasonable hint in my mind on the possible effects of Satureja khuzistanica essential oils on IB virus and other members of the Gammacoronavirus genus in the family Coronaviridae. Infectious bronchitis was reported to be caused by infectious bronchitis virus (IBV), a single stranded positive sense, enveloped RNA virus of 27–32 kb length. This virus has been classified under the Gammacoronavirus genus in the family Coronaviridae, order Nidovirales. Like other members of coronavirus family, the IBV genome possess structural and nonstructural proteins. Structural proteins comprise the spike [S] glycoprotein, envelope [E], matrix [M], and nucleocapsid [N]. These proteins involve vital functions in viral attachment, replication, and causing clinical disease. Among the major structural proteins, the M protein is the most profuse transmembrane protein, which play an essential role in coronavirus assembly through interaction with viral ribonucleocapsid and spike glycoprotein. Infectious bronchitis virus E protein exist, however, in a much limited frequency and contains highly hydrophobic transmembrane N-terminal and cytoplasmic C-terminal domains. Studies have shown that the E protein is resides merely in the Golgi complex in IBV infected cells and is integrally associated with viral envelope formation, assembly, budding, ion channel activity, and apoptosis. Similar to other coronaviruses, the phosphorylated 409 amino acid of IBV-N protein is highly conserved between amino acid residues 238 and 293. IBV-N protein binds with the genomic RNA to form a helical ribonucleoprotein complex (RNP), thus aiding transcription, replication, translation, and packaging of the viral genome during replication. The S1 segment of the spike glycoprotein have a vital role to play in the attachment and entry of the virus into the cell via sialic acid receptors and has been considered as the determinant for viral diversity and immune protection. This protein has been targeted for genotypic characterization as well as recombinant IBV serotypes vaccines (Bande et al., 2016).

Many researchers described the above-mentioned characteristics for IBV and many others confirmed their high similarities with all coronaviruses including the Coronavirus disease- 2019 (COVID-19). Under the current circumferences when COVID-19 causing huge death and fear of mortality and morbidity among the human communities all over the word, it is highly recommended to in depth characterize the effects of *Satureja khuzistanica* on coronaviruses *in in vitro* as well as *in vivo* experiments. I speculate that administration of Satureja khuzistanica in form of an herbal tea or capsules may be beneficial as a complementary medicine in reducing burden of the diseases caused by coronaviruses in particular IB, in animal species. The possible positive effects may be exerted trough declining the virus load in upper respiratory segment and gastrointestinal tract. It was reported that IB virus infects primarily the respiratory system but certain variants and many field isolates adversely affect the reproductive, renal, and digestive systems too.

A Brief Discussion

According to the phytochemical analyses conducted in our researches, *Satureja khuzistanica* essential oils contained a verity of ingredients with up to 94 percent carvacrol as the major active component (Figure 1). In almost all our previous works we found carvacrol as the main component in *Satureja khuzistanica* essential oils (Table 1), the peculiarity causing Khosravinia et al. (2013) describes the plant as a 'bioreactor of carvacrol'. Extensive works by many researchers, in particular, Khosravinia et al. (2013, 2015, 2016), demonstrated anti-inflammatory, antioxidant and anti-hyperlipidemic and blood cholesterol lowering effects for Satureja khuzistanica essential oils, the beneficial effects which mainly attributed to carvacrol. Commercial production of the plant concomitant with an intensified plant breeding program to maintain the high carvacrol magnitudes in the plant provided a unique opportunity to access adequate materials required in farm scale experiments on the commercial formulations of the same remedy.

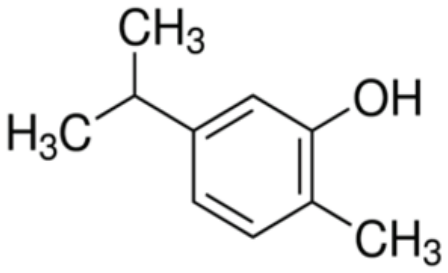

Figure 1: *Molecular structure of Carvacrol.*

Conflict of Interest

The author is currently a Lorestan university employee and declares no conflict of interest.

Compound	RI1	Composition, %	Identification
α-Thjene	925	0.24 ± 0.14	RI, MS
α-Pinene	933	0.15 ± 0.05	RI,MS,Col
Myreene	981	0.26 ± 0.19	RI,MS
α –Terpinene	1013	0.24 ± 0.12	RI,MS,Col
p-Cymene	1017	1.26 ± 0.86	RI,MS,Col
Linonene	1026	0.13 ± 0.04	RI,MS,Col
(Z)-β-Oeimene	1036	0.54 ± 0.08	RI,MS
γ-Terpenene	1053	0.74 ± 0.23	RI,MS,Col
Trans-Sabinene hydrate	1081	0.17 ± 0.02	RI,MS
Terpin-4-ol	1163	tr	RI,MS
α-Terpinole	1175	0.42 ± 0.45	RI,MS
Thymol	1266	tr	RI,MS,Col
Carvacrol	1282	92.16 ± 0.46	RI,MS,Col
Thymyl acetate	1329	tr	RI,MS
β-caryophyllence	1425	0.16 ± 0.01	RI,MS,Col
α-Humulene	1427	tr	RI,MS
β-Bisabolene	1501	tr	RI,MS
Trans-β-bisabolene	1522	0.10 ± 0.01	RI,MS
1 retention indices determined relative to n-alkanes (C6–C24) on a DB-5GC column, tr trace (<0.05 %). tr.; in trace			

Table 1: *The composition of Satureja khuzistanica essential oils (Khosravinia et al., 2013).*

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