THE EFFECTS OF SOME ESSENTIAL OILS ON IN VITRO GAS PRODUCTION OF DIFFERENT FEEDSTUFFS

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Introduction

The use of antibiotics as growth promoters in animal nutrition was banned after 2006 in the European Union. The use of essential oils appears to be one of the most natural alternatives to antibiotic use in animal nutrition. Many researchers have demonstrated potentially favourable effects of mixtures of essential oils. Many plant extracts have antimicrobial activities against a wide range of rumen microorganisms. Manipulation of the rumen microbial ecosystem for enhancing fibrous feed digestibility, reducing methane emission and nitrogen excretion by ruminants to improve their performance are some of the most important goals for animal nutritionists. The aim of this study was to determine the effect of essential oils of oleaste (OLE, *Eleagnus angustifolia*), mint (MNT, *Mentha longifolia*), rosemary (ROS, *Rosmarinus officinalis*), coriander; (COR, *Coriandrum sativum*),grape seed (GRA, *Vitis vinifera*), orange peel (ORA, *Citrus cinensis*), fennel (FEN, *Foenicum vulgare*) on *in vitro* gas production and gas production kinetics of barley, wheat straw and soybean meal.

Material and Method

In vitro gas productions and gas production kinetics were determined in *in vitro* gas production technique by supplying rumen liquor from three infertile Holstein cows. The study was carried out in a completely randomized design in 7 (essential oil) x 4 (dose) factorial arrangement.

Table 1. Chemical compositions of the feedstuffs and forage and concentrate fed to animals, g/kg DM

	DM	CP	EE	CF	Ash	NFE	NDF	ADF
Feeds	g/kg	g/kg DM						
Forage (corn silage)	318.3	105.7	35.1	236.1	88.8	534.3	453.6	296.1
Concentrates	907.9	281.4	44.3	96.2	60.7	517.4	266.9	93.4
Wheat straw	92.93	40.28	12.85	457.60	69.75	419.5	814.9	570.1
Soybean Meal	92.08	448.40	19.98	60.59	79.95	391.1	125.2	113.3
Barley	90.30	131.68	18.36	72.90	40.57	736.5	222.5	97.9

Barley, soybean meal and wheat straw were incubated for 3, 6, 9, 12, 24, 48, 72 and 96 h. 0, 50, 100, 150 ppm doses were tested for all essential oils. Chemical compositions of the feedstuffs and forage and concentrate fed to animals were given in Table 1. The data were analysed statistically using the GLM (General Linear Model) procedure of SPSS and treatment means were separated using Duncan's New Multiple Range Test

Conclusion

In conclusion, the additions of FEN, OLE-100, OLE-150, COR-150 and GRA-150 ruduced *in vitro* gas production pattern of barley, soybean meal and wheat straw feedstuffs compared to control group for all the incubation periods (P<0.01).These EO and theirs different doses or combinations can be used to improve performance and to manipulate rumen fermentation in ruminant diets.

Results

Table 2 shows the effects of essential oils on *in vitro* gas production of different feed stuffs. OLE and FEN were lower than control groups in terms of *in vitro* 24h gas production of barley (P<0.01). MNT was higher and FEN was lower than control group in terms of *in vitro* 24h gas production of soybean meal (P<0.01). While *in vitro* 24 h gas production of wheat straw were found lower for OLE and FEN groups compared to the control group (P<0.01).

Table 2. The effects of essential oils on in vitro gas production of wheat straw, soybean meal and barley, ml/200 mg DM

		Barley			Soybean meal			Wheat straw		
Treatment		**24,00 h**	**48,00 h**	**96,00 h**	**24,00 h**	**48,00 h**	**96,00 h**	**24,00 h**	**48,00 h**	**96,00 h**
Control		42,68^{abc}	64,37^{abcde}	68,51^{bcde}	34,01^{cde}	38,57^{de}	41,58^{cd}	22,17^{bcd}	33,59^{bcde}	38,84^{bcd}
OLE-50		37,59^{ef}	43,15^{fg}	50,27^{fg}	30,07^{e}	35,99^{ef}	39,82^{de}	12,67^{ef}	23,66^{fg}	29,62^{fgh}
OLE-100		38,39^{def}	44,06^{fg}	51,35^{fg}	20,42^{f}	31,30^{fg}	35,13^{ef}	5,16^{g}	13,56^{ik}	18,75^{j}
OLE-150		43,96^{d}	43,08^{fg}	50,39^{fg}	12,57^{g}	24,56^{hi}	30,50^{fg}	4,15^{g}	8,12^{k}	11,40^{k}
MNT-50		58,61^{a}	69,52^{ab}	74,26^{ab}	40,93^{ab}	45,27^{abc}	47,11^{abc}	24,44^{abc}	35,34^{abcd}	43,1^{abc}
MNT-100		57,99^{ab}	67,31^{abc}	71,23^{abc}	42,47^{a}	46,91^{ab}	47,99^{ab}	20,47^{bcd}	29,32^{cdef}	40,32^{abcd}
MNT-150		61,51^{a}	70,75^{a}	75,69^{a}	43,66^{a}	48,56^{a}	49,61^{a}	23,99^{abc}	34,94^{abcd}	44,41^{ab}
ROS-50		59,04^{a}	66,42^{abc}	71,63^{abc}	40,18^{abc}	45,31^{abc}	46,93^{abc}	22,56^{bcd}	35,03^{abcd}	41,56^{abcd}
ROS-100		58,696^{a}	64,36^{abcde}	71,15^{abcd}	40,75^{abc}	46,42^{abc}	48,28^{ab}	20,38^{bcd}	27,48^{def}	37,83^{bcde}
ROS-150		55,18^{abc}	62,09^{cde}	66,57^{cde}	37,53^{abcd}	45,50^{abc}	47,02^{abc}	17,95^{de}	28,32^{cdef}	35,58^{cdef}
COR-50		55,34^{abc}	63,76^{bcde}	67,24^{cde}	34,22^{bcd}	40,46^{bcde}	42,51^{bcd}	24,97^{abc}	35,80^{abc}	39,84^{bcd}
COR-100		50,15^{c}	57,65^{e}	64,04^{e}	20,13^{f}	28,06^{gh}	38,96^{de}	5,74^{g}	22,02^{fgh}	31,05^{efg}
COR-150		37,75^{ef}	41,66^{fg}	43,99^{h}	12,32^{g}	23,29^{hi}	29,53^{fg}	3,04^{g}	15,03^{hijk}	22,76^{hij}
GRA-50		55,06^{abc}	63,49^{bcde}	67,22^{cde}	31,11^{de}	38,32^{de}	42,41^{bcd}	19,30^{cd}	34,69^{abcd}	40,76^{abcd}
GRA-100		51,84^{bc}	58,71^{de}	65,11^{de}	31,59^{de}	40,03^{cde}	42,51^{bcd}	9,04^{fg}	26,06^{efg}	34,52^{defg}
GRA-150		43,36^{de}	45,74^{f}	54,44^{f}	20,05^{f}	29,44^{gh}	32,62^{f}	3,98^{g}	19,46^{ghij}	27,07^{ghi}
ORA-50		58,11^{ab}	65,29^{abcd}	68,31^{bcde}	38,58^{abc}	43,42^{abcd}	45,81^{abc}	24,41^{abc}	36,13^{abc}	39,51^{bcd}
ORA-100		59,46^{a}	67,14^{abc}	70,40^{abcd}	39,86^{abc}	44,32^{abcd}	46,25^{abc}	27,17^{ab}	40,11^{ab}	44,07^{ab}
ORA-150		60,91^{a}	68,80^{abc}	72,17^{abc}	43,73^{a}	48,99^{a}	50,94^{a}	29,57^{a}	42,56^{a}	47,91^{a}
FEN-50		36,37^{f}	46,70^{f}	51,97^{fg}	19,52^{f}	28,33^{gh}	31,23^{fg}	4,95^{g}	21,49^{fghi}	28,20^{fgh}
FEN-100		32,98^{f}	42,97^{fg}	47,96^{gh}	13,96^{fg}	24,27^{hi}	30,02^{fg}	2,98^{g}	13,87^{ijk}	19,82^{ij}
FEN-150		32,72^{f}	38,50^{g}	46,84^{gh}	12,24^{g}	19,46^{i}	25,76^{g}	2,49^{g}	14,07^{ijk}	19,88^{ij}
SEM		5,83	7,79	6,71	16,16	15,88	13,91	4,03	14,02	15,91
EFFECTS	EO	0.00	0.00	0,00	0,00	0,00	0,00	0,00	0,00	0.00
	Dose	0.00	0.00	0,00	0,00	0,00	0,00	0,00	0,00	0.00
	EO x Dose	0.00	0.00	0,00	0,00	0,00	0,00	0,00	0,00	0.00

EO: essential oils, EO: essential oils, OLE: Oleaster EO, MNT: Mint EO, ROS: Rosemary EO, COR: Coriander EO, GRA: Grape seed EO, ORA: Orange peel EO, FEN: Fennel EO, 50: 50 ppm dose, 100: 100 ppm dose, 150: 150 ppm dose, SEM: stantart eror of means a, b, c…. P<0.05.