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Practical Application of Medical Plant Powders as an Alternative of Antibiotic Growth Promoter in Pig Feed

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A study on adding some medical plants with antibacterial activity to the feed of hogs from post-weaning (21 days old) to slaughter (130 days old) was carried out on 121 LY x PiDu piglets. Powder of *Alpinia Officinarum* Hance or *Euphorbia thymifolia* Burm, or *Achyranthes aspera* L. plants was added by 0,5% to the diet.

Hogs in the groups which were given a diet with 0.5% powder of the plants showed a better weight gain than those not supplemented and an equal weight gain as compared to those offered a ration added with 50ppm chlotetracyline antibiotics. Hogs fed with medical plants-added feed demonstrated remarkable reduction in food consumption rates, diarrhea and respiratory symptoms and treament periods.

The hematology indexes observed in experimental groups which were supplemented with medical plants and in controlled groups were within the normal.

The quantity of carcass in all diet groups had no statistical difference. The percentage of carcass reached 78%, that of splited pork was approximately 70%. The color, taste, and toughness of the meat in diets added with medical plant powders were significantly improved as compared to those measured in controlled groups.

Keywords: growth promoter, pig, plant antibiotic, Alpinia Officinarum, Belamcanda Chinensis, Euphorbia thymifolia

Introduction:

A variety of synthetic feed additives including antibiotics are used in animal feed to maximize efficiency of production and to control disease. Due to public concerns regarding development of antibiotic-resistant bacteria, feed-mill industries are currently moving towards a reduction in use of synthetic antibiotics. There has been increased interest in the use of biological products such as probiotics, prebiotics, organic acide, and medicinal plants with antibacterial activity, as alternatives to antibiotics feed additives. According to Afshar M.A. (2012), antibiotics derived from medicinal plants are capable of stimulating weight gain, improving feed use efficiency, boosting the immune system, thereby reducing the number of disease-infected livestock. Natural compounds found in medicinal plants like polyphenols, flavonoids, and

polysaccharides are able to make meat products with stable antioxidants as a component, and also prolong their preservation without resorting to synthetic antibiotics Yeh, H.S. *et al.,* (2013). Hence, adding medicinal plants to animal feed will result in safe meat products which are good for consumer health, thereby enhancing product values of the animal husbandry.

Alpinia offficinarum Hance, *Euphorbia thymifolia* Burm, and *Belamcanda chinensis* DC Red, which are widely found in Vietnam, are highly susceptible to intestinal bacteria and fungi (Indrayan A.K., *et al*, ,2007). However, most studies on biological activity of these plants in Vietnam have just been carried out in laboratories. Various essential oil mixtures, which contain natural polyphenolic compounds or flavonoids as potential antimicrobial (Friedman, M., *et al.*, 2014) and antioxidant agents (Pandey, G., *et al.*, 2014). Therefore, in this study, we examined effects of adding medicinal plants to pig feed in order to assess influences of powdered *Alpinia offficinarum* Hance, *Euphorbia thymifolia* Burm, and *Belamcanda chinensis* DC Red on carcass performance as well as disease control.

Materials and methods:

Piglets LY x PD (Landrace x Yorshire) x (Pietran x Duroc) from post-weaing (21 days old) to 130 days old were randomly contributed to different blocks for experiment.

Dried powder of *Alpinia offficinarum* Hance, *Euphorbia thymifolia* Burm, and *Belamcanda chinensis* DC Red was prepared as follow: plants are collected and dried at 50^oC in the oven for 72 to 96 hours. The dry plant was grinded to fine powder before applying to the diets with the rate of 0,5%.

Design the experiment: diets with different additives, piglets from post-weaning at 21 days old to slaughter; Surveillance results are analyzed in two periods: from post-weaning to 60 days old and from 61 days old to 130 days old.

Set up the experiment:

Parameter	**Groups**				
	Control -	**CTC**	**Alp**	**Bel**	**Eup**
N1	6	7	6	6	6
N2	7	7	7	7	7
N3	7	7	7	7	7
Total	20	21	20	20	20
P_{TB}(kg)	6,55	6,83	6,85	6,70	6,78
SD	0,12	0,08	0,10	0,15	0,07
Rate of Additive	-	50ppm	0,5%	0,5%	0.5%

CTC: Chlotetracycline Alp: *Alpinia offficinarum*
Eup: *Euphorbia thymifolia* Bel: *Belamcanda chinensis*

Results and Discussion:

Effect of adding medicinal plants on weight gain:

Table 1: Results on weight gain of pigs fed additionally with medicinal plants

Parameter	**Groups**				
	Control -	**CTC**	**Alp**	**Bel**	**Eup**
Piglets from 21-60 days old					
FCR	1.53	1.31	1.32	1.40	1.44
ADG	294.74	320.51	320.51	312.82	313.46
Piglets from 61-130 days old					
FCR	2.38	2.14	2.16	2.25	2.31
ADG	858.57	1046.94	1062.14	1002.14	1020.71

FCR: Feed conversion ratio ADG: Average day gain (g/day)

Piglets from 21-60 days old that were supplemented with 0.5% powdered medicinal plants in their diets (*Alpinia offficinarum* Hance, *Euphorbia thymifolia* Burm, and *Belamcanda chinensis* DC Red) had a higher ADG (ADG fluctuated from 321.82 - 320.51g/piglet/day) and a higher FCR (FCR varied from 1.32 – 1.44kg/P) than those of piglets given controlled diets (-) (ADG was 294.74g/piglet/day and FCR was 1.53kg/P). This difference was also clear in the period of 60 - 130 days.

Tested piglets that were provided with 0.5% powder of *Alpinia offficinarum* Hance had the best ability to gain weight and consume feed. Specifically, ADG was 1062.14g/piglet/day and FCR was 2.16kg/P. Weight gain and feed consumption of tested piglets fed additionally with *Euphorbia thymifolia* Burm and *Belamcanda chinensis* DC Red were equal and all higher than those of piglets in controlled groups not being offered medicinal plants or antibiotics.

It can be seen that, with the addition of medicinal plants to diets of post-weaning piglets, weight gain and feed intake of pigs were equal to those observed in antibiotics-added diets. It is said that medicinal plants were useful for increasing feed intake, improving intestinal functions, and giving and edge to appetite (Namkung, H., *et al.*). This appetite is subject to taste and oil content of medicinal plants. Medicinal plants with antibacterial activity helped restrict bacterial actitivies in digestive system (Parmar, N. and M. Rawat, 2012), at the same time, stimulating the production of saliva, enhancing the effective activity of digestive enzymes, gallbladder and intestinal mucins (Namkung, H., *et al.).*

Effect of adding medicinal plants on disease resistance of pigs:

Table 2: Record of diarrhea, cough

Parameter	**Groups**				
	Control -	**CTC**	**Alp**	**Bel**	**Eup**
Piglets from 21-60 days old					
Diarrhea rate	7.06	0.98	1.03	2.44	1.41
Cough rate	5.69	-	-	-	-
Piglets from 61-130 days old					
Diarrhea rate	0.53	-	-	0.43	-
Cough rate	1.89	-	-	-	-

Pigs were most likely to be affected with diarrhea in the period of post-weaning to 60 days old. Results in Table 2 showed that: pigs supplemented with medicinal plants in their diets had a much lower percentage of diarrhea infection than the group not. In the controlled group which did not use antibiotics, there were 14 turns of piglets sufferring from diarrhea, correspondingly the percentage of day-infected piglet was over 7%; meanwhile, in groups added with antibiotics and medicinal plants, the percentage of affected piglets varied from 1.03 – 2.44%. Two diets mixed with 0.5% powdered *Euphorbia thymifolia* Burm and *Alpinia offficinarum* Hance indicated the best effect in lowering the percentage of diarrhea infection in pigs in both periods, especially the post-weaning one. Piglets having respiratory problems were only found in the diets without antibiotics.

The number of tested piglets to be discared was very low and it was too early to state that it was because of diets. Throughout the experiment, only 2 piglets were removed due to limpness and hernia (data not showed). We found no signs showing medicinal plants caused irritation and prevented pigs from digesting feed.

Effect of adding medicinal plants on some hematological indices of pigs

Table 3: Some hematological indices of pigs fed additionally with medicinal plants

Parameter	**Groups**				
	Control -	**CTC**	**Alp**	**Bel**	**Eup**
WBC 10^9	12,02	14,81	14,89	13,13	16,53
RBC 10^12	7,11	7,35	8,15	8,08	7,11
HGB g/L	117	115	120	139	112
HCT %	41,2	41,5	41,3	47,8	38,2
MCV fL	58,0	56,4	50,7	59,1	53,7
MCH pg	16,5	15,6	14,7	17,2	15,8
MCHC g/L	284	277	291	291	293
Protein (g/l)	58.52 ± 2.9	58.85 ± 3.27	58.89 ± 2.8	58.97 ± 3.58	58.19 ± 2.82
Albumin (g/l)	35.34 ± 5.8	34.14 ± 5.62	34.46 ± 5.28	31.51 ± 11.49	34.3 ± 5.51
Globurin (g/l)	22.54 ± 3.18	24.62 ± 3.62	23.84 ± 3.09	25.41 ± 3.92	23.26 ± 3.23
Biliburin (mmol/l)	1.53 ± 0.27	1.45 ± 0.21	1.50 ± 0.22	1.58 ± 0.09	1.43 ± 0.25
Ure (mmol/l)	4.35 ± 0.67	4.22 ± 0.77	4.17 ± 0.73	4.32 ± 0.64	4.50 ± 0.68
GOT (U/l)	34.5 ± 3.92	36.17 ± 1.08	34.62 ± 3.59	36.43 ± 0.91	34.18 ± 3.45
GPT (U/l)	37.24 ± 1.14	36.59 ± 1.23	37.33 ± 0.95	36.42 ± 1.08	37.06 ± 1.21

The difference was some change in biophysical and serum biochemical indices of pigs supplied with different diets. These indices were within normal limits of healthy pigs at a corresponding age.

A study by Nguyen Thi Kim Loan *et al.* (2010) suggested that the addition of curcuma longa and Allium sativum to pig feeding led to a change in hematological indices of pigs; the number of red cells, serum albumin of pigs were higher on using antibiotics-added diets. Supplementing medicinal plants to pig diets also reduced the number of pigs affected with *E.coli* and *Salmonella*

Analyzing hematuria, GOT, and GPT of tested pig blood revealed that adding medicinal plants to pig diets did not affect biophysical, biochemical functions at liver and kidney. Previous studies even pointed out that some natural compounds in medicinal plants like phenolic acids, flavonoids, anthocyanins and tanin helped prevent oxidation. They protected cells from free radical damage, promoting the conversion of nutrients, reducing toxins caused by such conversion Afshar, M.A.(2012).

Meat quality of pigs fed additionally with medicinal plants

Table 4. Effect of adding medicinal plants on carcass quality and meat quality

Parameter	**Groups**				
	Control -	**CTC**	**Alp**	**Bel**	**Eup**
Raw carcass rate (%)	78.2 ± 1.0	78.9 ± 2.1	77.8 ± 2.4	79.4 ± 2.0	82.6 ± 2.8
Dressed carcass rate (%)	69.9 ± 1.5	69.7 ± 1.3	61.4± 1.9	70.6 ± 1.8	73.3 ± 2.2
pH45	6.26	6.17	6.41	6.36	6.29
pH24	5.39	5.30	5.54	5.51	5.5
Light (L)	45.34	44.04	48.67	47.89	47.46
Red color	13.45	13.47	14.1	14.08	14.05
Yellow color	6.02	6.07	6.84	6.73	6.31
Evaporate (%)	3.01	3.05	2.54	2.89	2.67
Taste	4.1	4.4	4.9	4.8	4.8

Results in Table 4 showed that: adding 0.5% powder of *Euphorbia thymifolia* Burm, *Belamcanda chinensis* DC Red, and *Alpinia offficinarum* Hance to pig feeding did not affect carcass quality; dressing percentage reached up to 78%, carcass cutting yield recorded at approximately 70%. So, the addition of *Alpinia offficinarum* Hance to pig diets did not exert an effect on dressed carcass weight and carcass cutting yield.

Pork quality in groups using medicinal plants had taste and color improved most remarkably in all parameters. This suggested that taste of different medicinal plants did not produce clear influences on pork taste.

Yeh, H.S. *et al.* (2013), conducted a study on adding as much as 0.7% mixture of some medicinal plants to pig feeding and found that carcass quality did not change as compared to that of pigs fed additionally with synthetic antibiotics (chlortetracyline and oxytetracyline). However, color and drip loss of pork were significantly improved in comparison to controlled groups using antibiotics. This was attributed to the effect of two natural compounds polyphenol and flavonoid that are very popular in medicinal plants.

Conclusion

Adding 0.5% dried powder of *Alpinia offficinarum* Hance, *Euphorbia thymifolia* Burm, and *Belamcanda chinensis* DC Red to pig diets helped improve sharply carcass performance and meat quality.

Supplementing 0.5% of these powders to pig feeding may control diarrhea effectively. Using 0.5% powdered *Alpinia offficinarum* Hance to feed pigs made the best reduction in the percentage of day-infected pig; It can be added to pig diets to replace antibiotics for preventing diarrhea.

Biophysical and serum biochemical parameters of pigs fed additionally with 0.5% powdered medicinal plants are within the normal limits.

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