

# THE USE OF CASSAVA ROOTS AND LEAVES FOR FEEDING PIGS IN VIETNAM

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# INTRODUCTION

- ◆ In Viet nam cassava is the second most important food crop, annual root production is about 2 million tonnes (GSO, 2001) the majority of which is used for animal feeding. Cassava root contain high levels of energy and minimal levels of CP have been used as an energy source for animals.
- ◆ At harvesting time, fresh collected leaves yield is about 5 ton/ha ( Mui 1994) when the roots harvested. The high protein content with almost 0.85 of the CP fraction as true protein ( Ravindran 1993), cassava leaves have been used as a protein source for pigs.
- ◆ The greatest limitation to the use of cassava as animal feed is its content of toxic cyanogenic glycoside. Sun- drying and ensiling have been studied as means of conserving the cassava and reducing the cyanide content.
- ◆ In the rainy season it is difficult to sun- dry. Making silage is appropriate method to preserve cassava roots and leaves and reduced toxicity of HCN and applicable in village condition.

# USE OF ENSILED CASSAVA ROOTS FOR PIGS

## **Silage making**

- ◆ Sun - drying of roots is the method of processing commonly used by farmers. After harvesting, the roots are cleared, chopped by hand or by machine into small pieces and sun-dried and stored. However, in the rainy season it is difficult to sun-dry.
- ◆ Ensiling could be a suitable alternative way of preserving cassava
- ◆ After harvesting, roots were cleared, ground and mixed with 0.5 % NaCl. The mixture was put into plastic bags of 20 -30 l, pressed air and tied, and then let ferment naturally. The mixture could be used after 2 -3 weeks ensiling and lasted 5 -6 months.

## **Effect of ECR on station and on farm studied**

Tab. 1. Effect of Ensiling process on pH and HCN content of cassava roots

Day of ensiling	DM(%)	pH	HCN(mg/kg fresh root)	%as day 0 of ensiling
0	37.5	6.6	112	100
30	37.8	4.1	77	69
60	37.4	3.8	59	53
90	37.3	3.8	51	46
120	37.3	3.8	44	41
150	37.4	3.8	39	35

Tab. 2. Effect of different levels ECR in the diets of growing pigs on performance

	CTRL	20 ECR	40 ECR	60 ECR	SE/P
No. of Pigs ( head)	9	9	9	9	
Live weigh (kg)					
- initial	18.6	18.7	18.5	18.6	0.36/0.9
- final	89.2 <sup>a</sup>	89.6 <sup>a</sup>	86.5 <sup>a</sup>	70.2 <sup>b</sup>	0.84/0.001
Daily gain (g/day)	588 <sup>a</sup>	591 <sup>a</sup>	567 <sup>a</sup>	428 <sup>b</sup>	11.1/0.001
Feed in take (kg/day)	2.07 <sup>a</sup>	2.09 <sup>a</sup>	2.02 <sup>a</sup>	1.78 <sup>b</sup>	0.01/0.001
DM feed conversion	3.52 <sup>a</sup>	3.54 <sup>a</sup>	3.56 <sup>a</sup>	4.16 <sup>b</sup>	0.09/0.001

Source: Nguyen Thi Loc, 2001

Table 3. Effect of using ECR in diets of growing pigs on performance under farm conditions

	Control	30 ECR
Live weigh (kg)		
- Initial	27.79	28.75
-Final	61.90	64.68
Daily gain (g/day)	378.90	400.50
FCR	4.34	4.10
Feed cost/kg gain (VND)	7237	6711

- The effect of using ECR ( 30 % DM) in growing pigs diet in Huong van village is shown in table 3.
- There was significant different in daily weight gain and feed conversion ratio between the pigs fed control diet and the ECR diet ( $P<0.05$ ).
- Daily weight gain of ECR treatment was higher than (5.4 %) the control treatment.
- Feed cost of ECR treatment was lower than (7.3 %) the control treatment.
- Using a 30 % of DM inclusion of ECR in the pig's ration improved the daily gain and significantly reduced feed cost/kg gain (  $P<0.05$ ).

Table 4. The effects of supplementation of DL-Methionine in the pigs diets with 40ECR

	CTRL	Mo.1	Mo.2	Mo.3	SE/P
Live weigh (kg)					
- initial	20	19.9	19.6	20.0	0.15/0.15
- final	88.2	93.3	96.9	95.4	0.40/0.001
Daily gain (g/day)	568	611	645	628	3.20/0.001
Feed intake (kg/day)	2.1	2.1	2.1	2.1	0.02/0.42
FCR	3.7	3.5	3.2	3.3	0.03/0.001
Feed cost/kg gain (1000 VND)	8.8	8.3	8.1	8.4	0.07/0.001

Source: Nguyen Thi Loc, 2001

\* CTRL : control diet contain 40 % DM from ECR

\* Mo1; Mo2; Mo3 : Diet has supplement 0.1; 0.2; and 0.3 % Methionie as DM)

- The effect of supplementation different levels of % DL - Met in basal ECR diet is shown in table 4.
- The data indicate: There were significant differences in daily gain and feed conversion ratio as well as feed cost between the pigs fed the control diet and the Met diets ( $P < 0.001$ ).
- The daily gain of pigs was higher than, the feed conversion and feed cost was lower than with DL - Met supplementation .
- Higher economical efficiency was found when including levels of 0.1, 0.2 and 0.3 (as DM ) DL - Met supplementation in ECR based diet. Level 0.2 % Met was the highest economical efficiency in those treatment.

# Effect of supplement L- lysine and DL - Methionine in the diet of growing pigs with ensiled cassava roots on performance

- ✓ The experiment was carried out on station of Quang Tri college of Agriculture , Quang Tri province from February to June 2000 .
- ✓ 20 pigs all cross breeds between Landrace x (Mong cai x Large White) with LW of 14 kg were randomly into two groups.
- ✓ First group of pigs was fed the control diet which: rice bran + fish meal + supplement (ME: 12 MJME; CP: 17 %; Lys : 0.8 %; Met : 0.3 % as DM ).
- ✓ The second group of pigs was fed the experiment diet : 70 % DM from control diet + 30 % DM from ECR and supplement 0.1 % L - Lys and 0.05 % DL - Met. (ME/kg DM : 12 MJME; CP: 15 %; Lysine : 0.8 %; Met : 0.3 % as DM ).
- ✓ The experiment lasted for 110 days.

Table 5. Effect of supplementation of DL - Methionine and L - Lysine in the growing diet pigs with ensiled cassava roots on performance

	Control	ECR
No. of pigs ( head)	10	10
Live weigh (kg)		
- Initial	14.15	13.9
-Final	80.8	79.75
Daily gain (g/day)	605.9	598.6
FRC	2.78	2.80
Feed cost/kg gain (VND)	7102.8	6933.9

- The effect of supplement 0.1 % L- Lysine and .05 % DL - Met in growing pigs diet with 30 % ECR is shown in table 5.
- Throughout in experiment the CP % contain in ECR diet was lower ( 2 % ) than the control diet but, there was no significant differences in daily weight gain and feed conversion ratio between the pigs fed the ECR diet and the control diet ( $P > 0.05$ ).
- Feed cost in ECR treatment was lower than (3 %) the control treatment.
- Using a 30 % ECR and supplement Amino Acids inclusion in the pig's ration did not effect performance but, regularly reduced feed cost/kg gain .

Making silage is an appropriate method to preserve cassava roots to be used for pig feeding .

Using 40 % ECR in diet of growing pigs does not affect their performance.

Supplementation DL - Met and L - Lysine in ECR -based diet improved performance of growing pigs.

In conclusion, cassava roots were used efficiently for growing pigs

High proportion of ECR in the diet makes low protein content and imbalance of essential amino acids could be limit their inclusion in diet.

**Ensiled cassava leaves for feeding growing pigs and sows**

# ENSILAE CASSAVA LEAVES

## PROCESSING

- ◆ Fresh leaves of cassava were collected when the roots harvested. The leaves were separated from the stems and petioles, chopped into small pieces ( 2-3 cm) and mixed with 0.5 % NaCl and ensiled with additives.
- ◆ Additives used in ensiling process were available in village conditions such as: rice bran, molasses, cassava root meal at 5 or 10 % levels (fresh basis) had good quality up to 5 months (Loc, 1999; Ly et al 2000).
- ◆ However cassava roots contain high levels of energy and available could be used as additive ensiling with cassava leaves at harvested.

## FEEDING

*The effect of additives by cassava roots on the quality of ensiled cassava leaves and using ensiled cassava leaves for feeding growing pigs and sows*

### Objectives:

- ◆ To find out appropriate preservation methods mixture of cassava leaves and roots by ensiling.
- ◆ To evaluate the use cassava leaves by ensiling for feeding pigs under farm conditions.

## ***The effect of additive by cassava roots on the quality of ensiled cassava leaves***

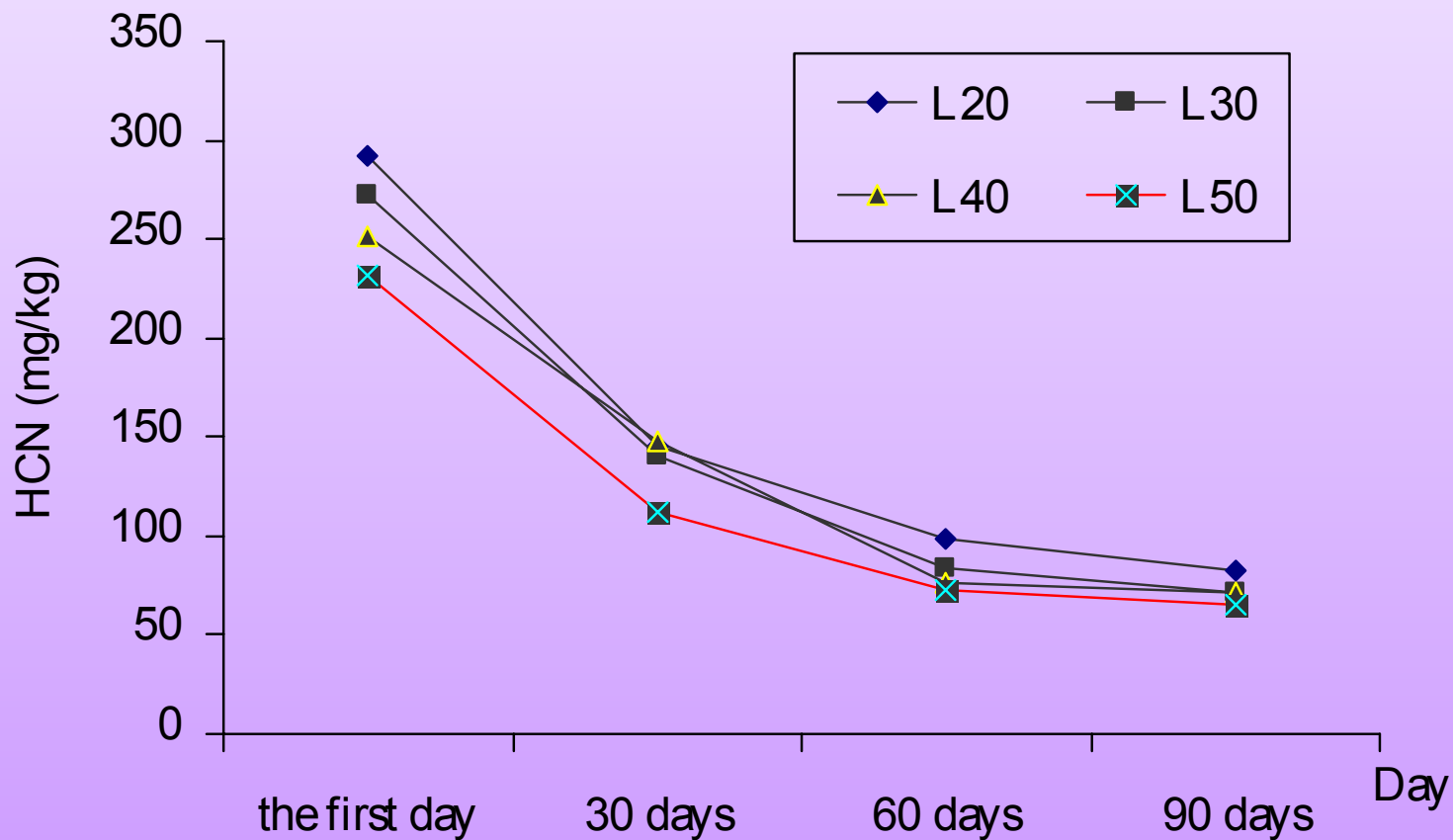
- The leaves were separated from the stems and petioles, chopped into small pieces (2 - 3 cm), mixed with 0.5 % NaCl and fresh cassava roots at different levels. The 4 treatments were:
  - 1. L20: cassava leaves + 20 % fresh cassava roots (fresh basis)
  - 2. L30: cassava leaves + 30 % fresh cassava roots
  - 3. L40: cassava leaves + 40 % fresh cassava roots
  - 4. L50: cassava leaves + 50 % fresh cassava roots
- The silage was analyzed for dry matter ( DM), crude protein CP) and HCN at the first, 30, 60 and 90 days after ensiling.
- The analysis were done in the University laboratories from 12/2001 to 3/2002.

**Table 6: The effect of additives by cassava roots and time on the content of DM and CP (% DM) of ECL**

Days ensiling	Treat	L20		L30		L40		L50	
		DM	CP	DM	CP	DM	CP	DM	CP
1		26.81	27.53	28.21	24.54	29.59	22.52	29.39	21.40
30		25.74	26.38	26.66	24.17	27.35	21.60	28.57	20.80
60		25.54	25.81	27.92	23.62	28.62	21.23	28.65	20.11
90		26.42	25.08	27.83	22.56	28.32	21.56	28.35	19.79

- The DM content were increased slightly if increasing levels cassava roots .
- The CP content were decreased if increasing levels cassava roots.
- The DM and CP content were decreased slightly from the first day to 90 days after ensiling but there were no significant different ( $P>0.05$ ).
- The HCN content of ECLR was decreased very quickly from the first day to 30 days and then decreased still 90 days of ensiling (fig. 1). The HCN was about only from 26.2 - 28.1 % at 90 days of ensiling.

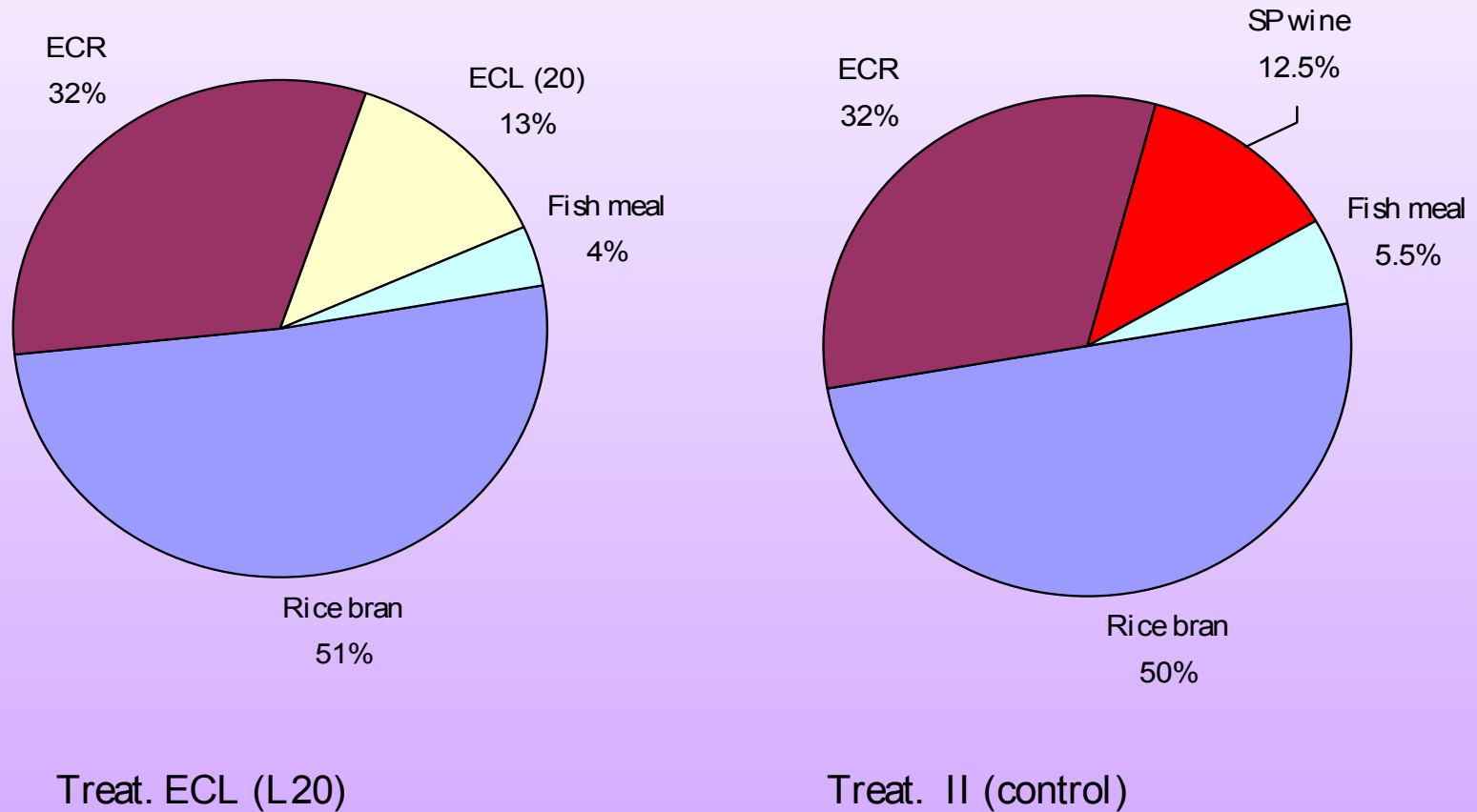
**Figure 1: Effect of additives by cassava roots and time on the content of HCN (mg/kg)**



## Using ensiled cassava leaves in the diet of fattening pigs on performance at Hong Ha village

- ✓ The experiment was carried out in five households of Hong Ha village ( up land area in Thua Thien Hue province) from December 2000 to May 2001.
- ✓ 12 pigs all cross breeds between Mong cai and Large White with live weights of around 24 -27 kg were randomly allocated to 5 families .
- ✓ each farmer kept 2 pigs ( or 4 pigs) were allocated with one pigs ( or 2 pigs) per pen .One group of pigs on each farmer was fed the control diet which content: rice bran (50 %)+ fish meal (5.5%) + Ensiled cassava root (32 %) + Sweet potato vines ( 12.5 %) as DM the second group of pigs was fed the experiment diet ( Figure 2) in which contain 45 % DM from cassava (13 % ECL( L20) + 32 % ECR). ECL replace a part fishmeal and all SP vine in control treatment.
- ✓ The experiment lasted for 90 days.

Figure 2. ingredients in the diets of pigs ( % as DM)  
at Hong Ha village



**Table 7: EFFECT OF USING ENSILED CASSAVA LEAVES (L20) IN THE DIET ON THE PERFORMANCE OF FATTING FAT PIGS**

	Control	ECL
Initial LW(kg)	24.3	26.9
No.of Days Exper. (day)	90	90
Final LW (kg)	52.5	57.8
Total Gain (kg)	28.2	30.83
Dayly gain (g/day)	313.3	342.5
FCR	4.83	4.36
Feed cost /kg gain (VND)	10745	7863
% compare control treat.	100	73.2

- ✓ The effect of using 13 % ECL (L20) in fattening fat ration is shown in table 7.
- ✓ Daily weight gain of pigs was higher (9.32 %) and feed conversion was lower (9.73 %) with ECL treatment (13 % ECL (L20) + 32 % ECR). However there was no significant difference in 2 treatments ( $P > 0.05$ ).
- ✓ Feed cost of ECL diet was lower than (26.83 %) the control treatment.
- ✓ Using a 45 % DM from ensiled cassava (ECL 13% and ECR 32 %) in the fattening pigs diet does not affect the growth rate but significantly reduced feed cost/kg gain ( $P < 0.001$ ).

## **Effect of ensiled cassava leaves in the diet of growing pigs on performance at Huong van village**

- ✓ The experiment was carried out in four households of Huong Van village, Hue province, from December 2000 to May 2001.
- ✓ Four families raised a total 16 pigs (each farmer kept 4 pigs), all cross breeds between Mong cai and Large White with live weights of around 24 -25 kg. .
- ✓ Each farmer kept 4 pigs were allocated with 2pigs per pen .One group of pigs on each farmer was fed the control diet (Traditional diet) which content: rice bran + fermented fish + cassava meal + Sweet potato vines while the second group of pigs was fed the experiment diet : 85% control diet + 15% ECL
- ✓ The experiment lasted for 90 days.

**Table 8: EFFECT OF USING ENSILED CASSAVA LEAVES IN THE DIET ON THE PERFORMANCE OF GROWING PIGS**

	Control	ECL
Live weigh (kg)		
- Initial	24.18	24.34
-Final	58.58	60.75
Daily gain (g/day)	382.22	404.56
DM Feed conversion	4.86	4.58
Feed cost/kg gain (VND)	7904	5879

- The effect of using ECL (15 % DM) in growing pigs in Tab 8
- There was significant different in daily weight gain and FCR between the pigs fed control diet and the ECL diet ( $P < 0.05$ ).
- Daily weight gain of ECL treatment was higher than (5.83 %) the control treatment.
- Feed cost of ECL treatment was lower than (25.6 %) the control treatment.
- Using a 15 % of DM of ECL in the pig's ration did not effect on growth rate but significantly reduced feed cost/kg gain ( $P < 0.001$ ).

## Experiment . Effect of using ensiled cassava leaves during pregnancy on reproductive traits of Mong cai sows at the farm conditions.

Table 8. Effect of using ensiled cassava leaves in the diet for pregnant sows on reproductive traits (ECL 15: 15% ensiled cassava leaves in the diet)

	<b>Control</b>	<b>ECL 15</b>	<b>SE</b>	<b>P</b>
Live Piglets Born	11.3	10.3	1.06	0.535
Mean Piglets weight, kg	0.68	0.70	0.015	0.209
No. Pigs Weaned	9.75	9.14	0.925	0.632
Mean pig weight at weaning, kg	6.9	7.5	0.11	0.010
Total litter weight, kg	67.04	68.97	4.57	0.777

- ✓ The experiment was carried out at 16 households of Huong Van village.
- ✓ Sixteen MC sows at the third litter period were randomly allocated to two treatments
- ✓ Control: rice bran (57.9 %), CRM (16.5 %), fermented fish (11 %), sweet potato leaves (14.6 %) as DM. Daily feed intake: 1.37 kg DM; ME:14 ME MJ; CP:186 g
- ✓ Experimental: 85 % DM of control diet + 15 % DM of ECL
  - There were no significant differences between the two treatments for all the measured reproductive parameters of sows.
  - Pregnancy sows fed 15 % ECL improved their piglet live weight gain at weaning time.

Pigs on ECL treatment after 3 months experiment





# CONCLUSSION AND RECOMMENDATION

- ② \* Making silage is an appropriate method to preserve cassava roots and leaves to be used for pig feeding .
- ② \* Cassava roots contain high levels of energy and available could be used as additives with cassava leaves at harvested.
- ② \* Using 40 % ECR in diet of growing pigs does not affect their performance.
- ② \* Supplementation DL - Met and L - Lysine in ECR -based diet improved performance of growing pigs.
- ② \* In conclusion, cassava roots and leaves were used efficiently for growing pigs and sows
- ② \* High proportion of ECR in the diet makes probably imbalance of amino acids concentration, low protein content and imbalance of essential amino acids could be limit their inclusion in diet.