

VARIATIONS IN THE CHARACTERISTICS OF PASTURE LEGUME
ECOTYPES UNDER SHADE AND OPEN FIELD CONDITIONS *

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ABSTRACT

Thai ecotypes of *Stylosanthes hamata* cv. Verano and *Alysicarpus vaginalis* were collected from 6 localities (6.20'N to 18.15'N), and evaluated in 2 experimental sites at Narathiwat, one in open field and the other under coconut (relative light intensity: 31 %). Chiang Yuen ecotype of *Stylosanthes* was the tallest in both open field and under coconut. Pak Chong ecotypes showed largest canopy width in open field and fatun ecotype showed largest basal width under coconut. These ecotypes were divided into 2 groups by a cluster analysis.

Number of flower/pod of *Alysicarpus* in an early growth stage increased according as its origin proceed northward, except Pak Chong ecotype which was supposed equatorial origin. Lam Pang ecotype showed largest leaf length. These ecotypes were divided into 3 groups by a cluster analysis.

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INTRODUCTION

Hamata (Caribbean stylo. *Stylosanthes hamata* cv. Verano) was introduced to Thailand from Australia in 1970 (Pokasawat and Manidool 1989) and has proved well adapte to wide ranges of climatic and soil conditions. High adaptability is considered the cause of diversifying some distinct ecotypes in special conditions such as shade or poor soil conditions. and some morphological differences were recognized in isolated or special vegetation.

Alyce clover (*Alysicarpus vaginalis*) is a native of Asia and regarded as a good substitute for alfalfa in the tropics but it is not clear about morphological and physiological differences between ecotypes in Thailand.

This experiment aims to find characteristics differences and to consider the possibility for breeding of the two leguminous species.

MATERIALS AND METHODS

Young plants were collected at Lam Pang (LP, north, 18. 15'N, 99.28'E). Chiang Yuen (CY, northeast, 16.22'N, 103.06'E), Pak Chong (PC, central, 14.40'N, 101.23'E), Chum Phon (CF, south, 10.47'N, 99.12'E), Satun (ST, south, 6.46'N, 100.04'E) and Narathiwat (NR, south, 6.20'N, 101.56'E). Then transplanted on 13/8/87 and evaluated in 2 experimental sites at Narathiwat, one in open field, and the other under coconut (relative light intensity : 31 %)

Plot: 3 blocks x 6 ecotypes x 14 plants Plant spacing : 120 * 120 cm.

Fertilizer : N 3.0, P_2O_5 6.0, K_2O 3.0, lime 62.5 g/m²

Hamata : Plant type, leaf size, and leaf color of original plant were measured in the field.

Alyce clover : Open pollinated seeds were collected from original plant at Narathiwat on 25/12/87. Seeds were sown in the germination bed on 4/10/88, and kept in air-conditioned room (23-27 °C) for 2 days, after then left them in un-cooled room. seedlings were transplanted to peat pot (4.5 cm. in diameter, 5.0 cm. in height), immediately after germination, then kept in a shaded nursery until transplanting in the field on 29/11/88. Nuber of flower/seed-pod, plant height, canopy width, and leaf length were measured in the field.

RESULTS

Average plant height of hamata was 24.0 and 31.6 cm. in open field and - under coconut, respectively. Chiang Yuen ecotype was taller than any other ecotypes in both open field and under coconut, and significant difference at the 1 % level was recognized in the open field. Canopy width of the Pak Chong ecotype was largest in open field and basal width of the Satun ecotype was largest under coconut. Significant differences were recognized for both cases at the 1 % level (Table 1).

Hamata ecotypes were divided into two main groups i.e. group A (Lam Pang/Chiang Yuen, Pak Chong/Narathiwat) and group B (Chum Phon/Satun) by a cluster analysis using data on plant height, leaf length, etc.(Fig.1)

First germination of alyce clover occurred 4 days after the start of testing, and almost all viable seeds germinated within 19 days. Number of days for 66.7 % germination of viable seeds ranged from 6 days (Lam Pang) to 9 days (Pak Chong). Numbers of flower head were counted 1 month after trasplanting (Table 2). Average numbers of flower head (including pod) in open field and coconut plantation were as follows; LP:7.9, CY:6.3, PC:0.2, CP:4.6, ST:3.2, NR:2.6 (Fig. 2). These values increased according as its origin proceed northward, except Pak Chong ecotype. Leaf length of Lam Pang ecotype was the longest in both open and coconut plantation and significant difference was recognized at the 1 % level.

Alyce clover ecotypes were divided into 3 groups i.e. group A (Lam Pang), group B (Chiang Yuen, Chum Phon/Narathiwat, Satun) and group C (Pak Chong) as shown in Fig. 3.

DISCUSSION

Hamata ecotypes were divided into two main groups, one is the north/northeastern group and the other is the southern group, except Narathiwat ecotype. Narathiwat is the southernmost place, but this ecotype was classified into the north/northeastern group. There is a possibility that Narathiwat ecotype originated from Pak Chong, because the latter is the national center of pasture seed for experiment.

The existence of local groups and distinct ecotypes such as Chiang Yuen ecotype with tall plant height, Pak Chong ecotype with large canopy width, and Satun ecotype with shade tolerance suggest us importance and possibility of hamate breeding. It needs to find community characteristics between ecotypes for practical use in the future.

Ecotypes of varieties collected at high latitudes showed early maturity in many cases, such as soybean (Fukui and Arai 1951), Polygonum (Hammerton 1965) and lespedeza (Inami et al. 1987).

Number of flower head of alyce clover was considered as maturity indicator, because they were counted only 1 month after transplanting. These values increased according as its origin proceed northward, except Pak Chang ecotype. Correlation coefficient between latitude of collecting sites and number of flower head was 0.988 and

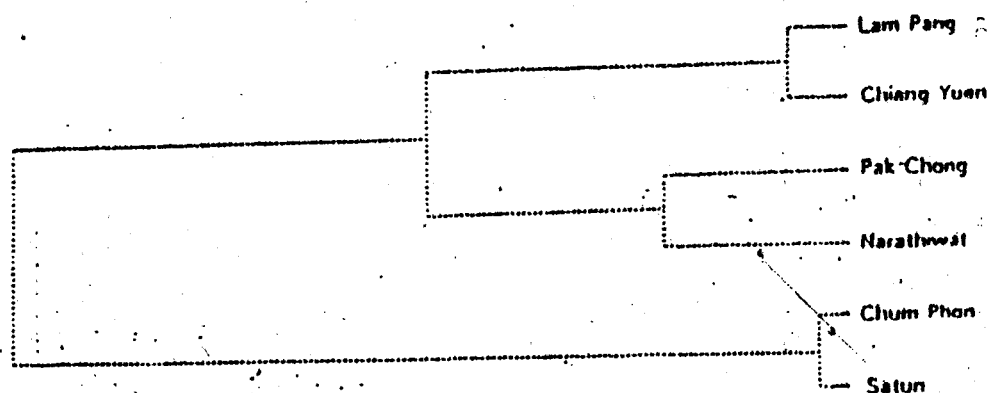
it was significant at the 1 % level when calculated without Pak Chong ecotype. This relationship suggests us the origin of Pak Chong ecotype was equatorial region and there is a possibility that it was derived from foreign ecotype, because they introduced many pasture species from USA in 1953. (Manidool, 1968).

Difference in characteristics such as maturity and leaf size suggested us importance and possibility of *Alysicarpus* breeding.

Table 1. Characteristics of hamata ecotypes (22/10/87)

Ecotype	LP	CY	PC	CP	ST	NIR	Mean
Open Field							
Plant height(cm)	26.0	27.9	21.7	23.8	22.8	21.9	24.0
Canopy width(cm)	90.4	81.3	102.1	91.3	97.1	82.2	90.7
Basal width (cm)	50.6	42.9	69.5	56.8	60.0	41.8	53.6
Leaf length (mm)	20.6	20.9	21.0	19.8	20.7	21.3	20.7
Leaf width (mm)	5.2	5.5	5.8	5.4	5.8	6.4	5.7
Leaf color*	2.38	2.57	2.57	3.36	3.29	2.60	2.80
Under Shade							
Plant height(cm)	27.5	34.6	33.3	32.5	31.1	30.6	31.6
Canopy width(cm)	50.7	54.9	56.4	51.2	72.3	50.3	56.0
Basal width (cm)	11.0	13.5	10.3	11.9	26.3	16.9	15.0
Leaf length (mm)	28.6	29.2	28.3	26.4	27.2	29.0	28.1
Leaf width (mm)	6.0	5.8	6.2	5.6	6.0	6.0	5.9
Leaf color*	3.23	3.19	3.52	3.38	3.28	3.43	3.34

* Score of leaf color. 1:green - 5:brown. (19/1/88)



LEVEL X 10

Fig.1 Clustering of hamata ecotypes by Q-type correlation (Weighted variable-group method)

Table 2 Characteristics of alyce clover ecotypes

Ecotype	LP	CY	PC	CP	ST	NR	Mean
Germination (day)	6	8	9	7	8	7	7.5
Open Field							
No. flower head	6.2	7.1	0.3	4.4	3.7	3.7	4.3
Seed pod (pair)	1.3	1.9	0.0	0.4	0.3	0.5	0.7
Plant height (cm)	12.5	15.5	13.0	15.1	16.0	15.7	14.6
Canopy width (cm)	61.1	60.5	52.0	51.3	55.3	50.8	55.2
Leaf length (mm)	36.6	18.9	22.0	21.0	20.1	20.5	23.2
Under Shade							
No. flower head	5.8	3.0	0.0	3.3	2.2	0.9	2.6
Seed pod (pair)	2.5	0.6	0.0	1.1	0.2	0.0	0.7
Plant height (cm)	26.9	24.7	32.7	21.8	22.3	24.4	25.5
Canopy width (cm)	33.8	32.2	42.1	31.0	41.0	35.2	35.9
Leaf length (mm)	32.4	22.5	30.0	21.7	24.0	18.3	24.7

Germination speed : days for 66.7 % germination of viable seeds

Number of flower head and number of pod pairs : 29/12/88

Plant height, canopy width and leaf length : 24/5/89

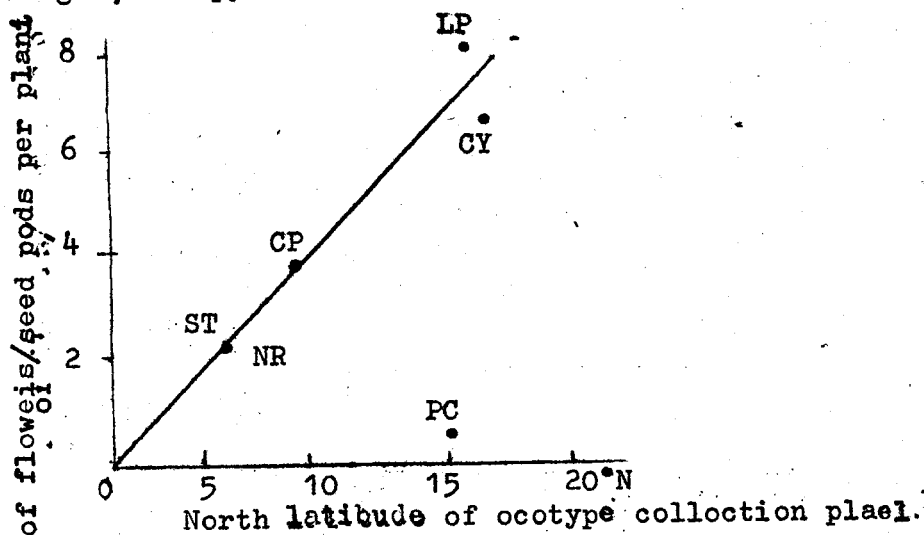


Fig. 2 Relation between north latitude and number of flower/pods

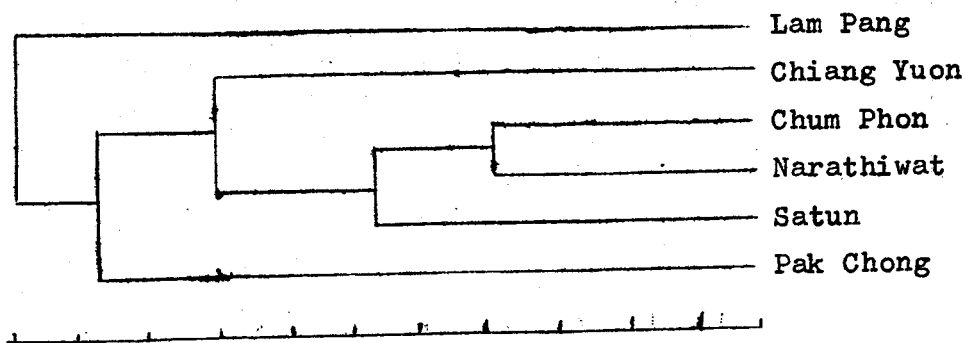


Fig. 3 Clustering of alyce clover ecotypes

Table 1. Characteristics of hamata ecotypes (22/10/87)

Ecotype	LP	CY	PC	CP	ST	NIT	Mean
Open Field							
Plant height(cm)	26.0	27.9	21.7	23.8	22.8	21.9	24.0
Canopy width(cm)	90.4	81.3	102.1	91.3	97.1	82.2	90.7
Basal width (cm)	50.6	42.9	69.5	56.8	60.0	41.8	53.6
Leaf length (mm)	20.6	20.9	21.0	19.8	20.7	21.3	20.7
Leaf width (mm)	5.2	5.5	5.8	5.4	5.8	6.4	5.7
Leaf color*	2.38	2.57	2.57	3.36	3.29	2.60	2.80
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Basal width (cm)	11.0	13.5	10.3	11.9	26.3	16.9	15.0
Leaf length (mm)	28.6	29.2	28.3	26.4	27.2	29.0	28.1
Leaf width (mm)	6.0	5.8	6.2	5.6	6.0	6.0	5.9
Leaf color*	3.23	3.19	3.52	3.38	3.28	3.43	3.34

* Score of leaf color. 1:green - 5:brown. (19/1/88)

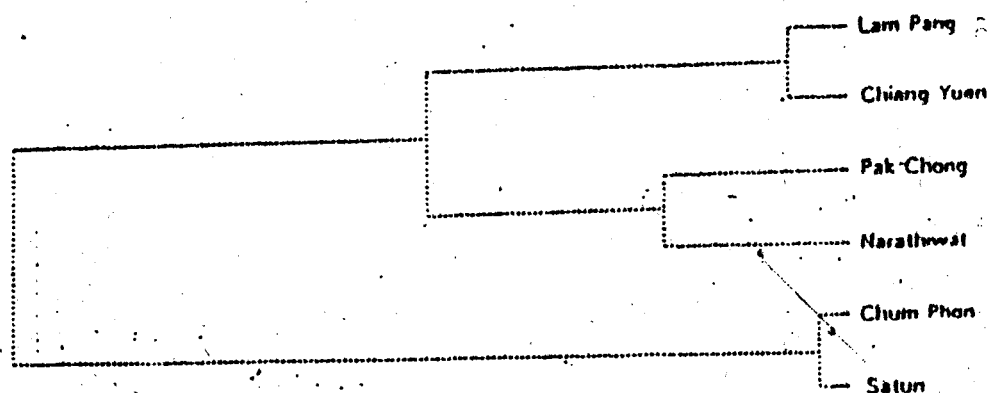


Fig.1 Clustering of hamata ecotypes by Q-type correlation (Weighted variable-group method)

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