



Preliminary Evaluation of Promising Sweet Corn Hybrid

Professor Ghulam Rasoul Samadi

Department of Horticulture, Agriculture Faculty, Kabul University

E-mail: samadigr@gmail.com

Abstract

Sweet corn is a popular vegetable known for its sweet, juicy kernels and nutrition value. This experiment was conducted to analysis the growth, yield and sugar content of different hybrid varieties of sweet corn. The experiment was laid out as a randomized complete block design (RCBD), 23 hybrid varieties and one check (24 treatments) with two replications. This experiment was conducted in Thailand from December, 8th, 2005 to February, 24th, 2006. There are several hybrid varieties of sweetcorn available that offer improved traits such as disease resistance, high yields, and enhanced flavor. Among the 23 hybrids and check tested for their yield, sweetness and horticultural characteristics, check (hybrid) has high yield with sugary enhanced. Among hybrids, SYX 6014 line has high marketable yield with sugary enhanced. Based on sweetness among 24 hybrids, SYX 6009, SYX 6016 and SYX 6025 are super sweet hybrids.

Key words: Hybrid, Organoleptic, Sweetcorn, Sweetness Yield

د امید بښونکو خوړو جوړو د دوه رگه وراثتي گانو لومړني ارزونه

پوهاند غلام رسول صمدی، د کابل پوهنتون، د کرنې پوهنځی، د ښووالي څانگې استاد

لنډيز

خواره جوړي يو مشهور سابه دی چې د خوړوالي، خوړو دانو او غذايي ارزښت له کبله پېژندل کيږي. دا څېړنه د خوړو جوړو د بيلايلو دوه رگه وراثتي گانو د ودی، حاصل او خوړوالي د لومړني ارزونې په هکله ترسره شوی ده. دا څېړنه تصادفي بشپړ بلاک ډيزاين (RCBD) چې ۲۴ ترتمنت او هر ترتمنت يی دوه تکرار لری ترسره شوی ده. دا څېړنه په تايلند کې د ۲۰۰۵ څخه تر ۲۰۰۶ کلونو په ترڅ کې ترسره شوی ده. د خوړو جوړو څو دوه رگه ډولونه شتون لري چې ښه ځانگړتياوې لکه د ناروغيو په مقابل کې مقاومت، لوړ حاصلات او ښه خوند لري. د خوړو جوړو ۲۳ دوه رگه او محلی دوه رگه په منځ کې چې د دوی د حاصلاتو، خوړوالي او هارتيکلچري ځانگړتياو لپاره آزمويل شوي وه، کنترول (دوه رگه) لوړ حاصل او ډير خوړوالي يې درلود. د دوه رگه وراثتي گانو په منځ کې، د SYX 6014 دوه رگه د لوړ بازار وړ حاصلات درلودل او هم يې د قندی موادو اندازه ډيره وه. د ۲۴ دوه رگه وراثتي گانو ترمنځ د خوړوالي پر بنسټ، SYX 6009، SYX 6016 او SYX 6025 خورا خوړي دوه رگه وراثتي گانې وې

واژه های کلیدی: هايبريد، اوگانولپتيک، خواره جوړي، خواره جوړي حاصل

Introduction

Corn (*Zea mays* cv. *rugosa* L.) originated in America and was grown by the Indians. It belongs to Poaceae (Graminae) family (4, 5). Sweet corn is a warm-season or heat-loving crop. It can be growing very successfully in tropical, subtropical and temperate climate conditions, in other word sweet corn is adapted to a wide range of climate, but do not plant sweet corn into a cold (less than 17°C) and wet soil (1,4). Sweet corn is wind-pollinated crop and square planting patterns result in greater pollination (6, 10). Sweet corn is distinguished from other field crops, sweet corns by its high sugar content when in the milk and early dough stage and by its wrinkled translucent kernel when dry (6, 11). The sweet corn seed is shrunken especially the super sweet types and do not germinate as well as smooth seed (4,8). Does not plant too early in the spring, wait until the soil is warm, about 65°F. There are number of Sweet Corn varieties with different shape and colors, such as yellow, white and bicolor (1,3). Nearly all sweet corn varieties sold today is a hybrid with different yield potential, sugar content and resistant to the pests. The maturity dates are relative; the actual number of days to harvest varies from year to year and location to location (9, 14, 15). Sweet corn is popularly used in various forms such as boiled, steamed, and roasted. It is also canned or vacuum packed as whole kernel, creamed and canned as cream style and frozen as whole kernel or on the cob. Sweet corn is part of numerous dishes (11,13).

The nutritional value of sweet corn includes high amounts of carbohydrates, vitamins and fiber. One medium ear (90 g) has only 80 calories, 1 g fat, 3 g of dietary fiber, 10% vitamin C, 2% vitamin A and 2% iron. According to sugar content, sweet corn is divided in following groups: standard sugary, sugary enhanced and super sweet (2, 10). Several insects and diseases attack sweet corn, and the most destructive insect is corn ear worm and the most serious disease is bacterial wilt. Early plantings are not badly infested, but later harvests will usually have severe ear worm damage unless timely control measures are followed (3). Field arrangement and planting schedule are planned to prevent cross-pollination between the sweet corn, field corn, and popcorn. If sweet corn is crossed with field corn or popcorn, it will not develop high sugar content and will be starchy. Cross-pollination between yellow and white sweet corn varieties affects only the appearance of the white corn but not

the eating quality (2, 4, 9, 13). The best time to harvest sweet corn is known as the “milk stage” when the ears are fully formed but not yet ripe. This stage usually lasts about a week. The farmer can determine when the corn is ready to harvest by looking at the silks, husks, and kernels. The silks should be brown and starting to dry, which occurs about 3 weeks after the silks first appear. The husks should hold tightly to the ear and the kernels should produce a little milky fluid when pierced. Super sweets will produce a clearer liquid. Each stalk of corn should yield at least one ear, and sometimes more (10, 14, 15). Sweet corn is harvest in the cooler hours of the morning by removing the ears of corn by twisting them at the base and pulling them off. After harvest, the cornstalks can be removed and used as compost (8, 13). The corn is stored in cool temperatures, usually around 38°F, the cooler the better. If the cobs are stored too long, there is a risk of changing the flavor and reducing quality, as sugars begin to convert to starch almost right away in the kernels. The corn can also be cooled by resting it in crushed ice or placing in a container with ice water. After cooling, the corn is placed in plastic bags with a few small holes punched in them, and then in the refrigerator for storage. Depending on the variety, it is best to eat the corn within a few days after harvest (6, 14, 15). It is important to mention that the climate condition of Afghanistan is suitable for growing of sweet corn. Also, farmers are growing sweet corn every year, but the main constraints are lack of improved sweet corn seed, crossing, low yield, low content of sugar and pests. The most important problems are low yield, low sugar content and pests. There are many existing varieties of sweet corn being grown in Thailand, both hybrids and open-pollinated. However, breeders continue to develop new lines and hybrids to improve yield potential and eating quality. This experiment was conducted to select the promising F₁ hybrids having high yield, high sugar content, good quality, desirable horticultural characters, and resistance to diseases and insects.

Materials and Methods

The experiment was conducted in the experimental field of AVRDC-ARC at Kasetsart University Kamphaeng Saen campus, Nakhon Pathom, Thailand from December, 8th, 2005 to February, 24th, 2006. A total of 23 experimental sweet corn hybrids developed in were used in the preliminary evaluation trial. Hybrid 3, a locally grown F₁ hybrid, was used a check.

The trial was laid out in Randomized Complete Block Design (RCBD) with 2 replications (7). Plot size was (1.6 x 5) m² with one bed per plot and 2rows/bed. After land preparation, the beds were covered by black plastic as mulch. The plants were spaced 30 cm within the row and 80 cm between rows. Each replication consisted of 32 plants/plot and 16 plants per row. Two seeds were sown per hill and the thinning was done two weeks after sowing. Replanting of missing hills was done on December 14th, 2005. Fertilizer was applied twice: first as basal with NPK (15-15-15) at 250 kg/ha, and urea (46-0-0) as side dressing at the rate of 104 kg/ha one month after sowing. During the growing season, the field was irrigated by furrow method and 4 times weeded were done. At the harvesting time 4 plants per row both the first and the end of row per plot excluding. Harvesting was done once. During growing season and after harvesting, the following data were collected:

- Based on sample - 4 plants and 4 ears from 2 rows of each plot were randomly selected for data collection on plant height, height of topmost ear, brix, color of cooked grain, total ear length, total length of productive ear, ear diameter, core diameter, grain depth, color of fresh grains, and number of grain rows.
- Based on whole plot - plant stand, days to 50% tassel, days to 50% silk, days to 100% harvest, % singled-eared plants total ears harvested, gross weight of un-husked ears, net weight, total number of marketable ears, total number of non-marketable ears, marketable yield, non-marketable yield, total yield, lodging, overall plant uniformity, pest's incidence and organoleptic test on sample basis.

Analysis of variance and Duncan's multiple range test (DMRT) were made for most of the characters (7).

Results and Discussion

Yield

The yield data on table 1 showed that although there were significant differences, none of the entries were significantly better than the check but it was not significantly different. The check gave the highest total yield and gross weight at 12.7 t/ha and 19.90 t/ha, respectively. SYX 6014 gave highest marketable yield at 10.30 t/ha, but it is not significantly different than check. Among the hybrids, SYX 6014 line gave the highest total yield, marketable yield, gross weight, single-eared plants (%) and more marketable ears. The results obtained from this research is agree with the research conducted on growth, yield and sugar content of different varieties of sweet corn and harvest time, there were significant difference among the sweet varieties on growth, yield and sugar content (12). In other research study, reported that there is a significant different among sweet corn hybrid varieties on yield and sugar content (6).

Yield components, agronomic, horticultural characteristics and pests. The yield components, agronomic and horticultural characteristics data in tables 2 and 3 showed that there were significant differences among hybrids. SYX 6019 had highest plant growth at 298 cm which was significantly different than check. The results of this experiment were confirmed with results of research was conducted on growth, yield and sugar content of different varieties of sweet corn and harvest time (12). None of hybrids were significantly better than check regarding height of topmost ear, days to 50% tasseling, plant stand, number of grain rows/ear, ear length and core diameter. There were no significant differences among hybrids about days to 50% silking, overall uniformity, depth of grain and length of productive ear. The results of this experiment showed that there were no significant different among hybrid varieties on agronomic growth and yield component, so the result of this research is not agree with results of research was conducted on growth, yield and sugar content of different varieties of sweet corn and harvest time (12). The diseases were not found on the crops, but few of cutworms were found in the ears. Cutworms damaged few of ears. In the field of sweet corn, there were not applied pesticides, because of no serious incidence of diseases and insects.

Table 1. Yield and yield components of 24 sweet corn hybrids in a preliminary evaluation trial. AVRDC-ARC, Kasetsart University, Nakhon Pathom, Thailand, December 2005-March

Line	Total yield mt/ha	Marketable Yield (t/ha)	Non-mark. Yield (t/ha)	% marketable yield	Gross weight (un-husked ear) (t/ha)	% Marketable ears/ha
Syx6001	9.40 abc	7.40 a-e	2.00	78.5 a-d	13.5 bc	79.4 a-e
Syx6002	10.8 abc	7.70 a-e	3.10	71.7 a-e	14.4 abc	72.5 a-f
Syx6003	10.5 abc	7.80 a-e	2.70	73.7 a-e	13.0 bc	74.6 a-f
Syx6004	10.3 abc	8.20 a-d	2.10	79.6 abc	13.5 bc	75.6 a-f
Syx6005	11.3 abc	9.00 ab	2.30	78.6 a-d	13.7 bc	76.2 a-f
Syx6007	9.40 abc	7.80 a-e	1.60	82.1 abc	13.1 bc	90.4 a
Syx6009	10.30 abc	8.50 a-d	1.80	82.5 abc	14.2 abc	82.8 a-d
Syx6010	9.10 abc	7.80 a-e	1.30	85.8 ab	11.8 bc	90.8 a
Syx6011	8.10 bc	4.90 b-e	3.20	59.8 de	12.4 bc	53.7 ef
Syx6012	9.10 abc	7.50 a-e	1.60	81.2 abc	15.0 abc	84.6 abc
Syx6013	10.6 abc	8.00 a-e	2.60	76.1 a-d	13.7 bc	75.2 a-f
Syx6014	11.8 ab	10.3 a	1.50	87.3 a	16.0 abc	88.1 ab
Syx6015	7.40 bc	5.00 b-e	2.40	67.3 cde	10.7 bc	65.1 b-f
Syx6016	11.3 abc	9.00 ab	2.30	80.5 abc	15.7 abc	76.4 a-f
Syx6017	9.40 abc	7.10 a-e	2.30	75.5 a-e	12.6 bc	73.6 a-f
Syx6018	10.7 abc	7.60 a-e	3.05	71.5 a-e	14.4 abc	64.7 b-f
Syx6019	10.3 abc	7.90 a-e	2.40	76.9 a-d	15.3 abc	73.4 a-f
Syx6020	10.3 abc	8.20 a-d	2.10	79.6 abc	16.6 ab	82.3 a-d
Syx6021	6.90 c	4.80 cde	2.10	69.4 b-e	10.4 c	65.4 b-f
Syx6022	6.80 c	3.90 e	2.90	56.2 e	14.2 abc	49.3 f
Syx6024	7.75 bc	4.55 de	3.20	60.3 de	14.8 abc	59.0 def
Syx6025	10.9 abc	8.80 abc	2.10	80.7 abc	14.4 abc	83.4 a-d
Syx6026	6.80 c	4.40 de	2.40	64.7 cde	11.6 bc	66.6 b-f
Hybrid 3 (check)	12.7 a	9.00 ab	3.70	70.9 a-e	19.9 a	60.5 c-f
Grand Mean	9.66	7.30	2.36	74.6	13.1	73.5
F-test	*	*	Ns	*	*	*
CV (%)	19.3	23.2	33.1	8.26	17.7	11.6

Means within the same column followed by the same letter are not different at 5% level of significance.

Table 2. Yield components and horticultural characters of 24 Sweet corn hybrids in a preliminary evaluation trial. AVRDC-ARC, Kasetsart University, Nakhon Pathom, Thailand, December 2005-March 2006.

Line	Plant height (cm)	Height to topmost ear (cm)	Days to 50% tasseling	Days to 50% silking	Plant stand	Overall uniformity	Depth of grain/cm	No. of grain row/ear	Single eared plants (%)
Syx6001	265 d-g	162 a-e	56.0 b-f	60.0	32.0 a	4.00	1.33	14.3 e-h	54.7 c-g
Syx6002	267c-g	154 b-f	55.0 d-g	60.0	32.0 a	4.50	1.09	14.8 c-h	53.1 c-g
Syx6003	266 d-g	148 def	55.5 c-g	60.0	30.5 a	4.50	1.34	13.8 gh	67.3 bcd
Syx6004	251 gh	145 ef	54.5 efg	60.5	31.5 a	4.50	1.03	15.6 b-g	63.5 b-e
Syx6005	285 a-d	172 ab	56.0 b-f	60.5	30.0 a	4.50	1.28	17.0 abc	30.1 ghi
Syx6007	269 b-g	163 a-e	57.0 a-e	60.5	28.5 a	3.50	1.24	14.0 fgh	36.7 f-i
Syx6009	257 g	148 def	55.5 c-g	60.0	29.5 a	4.50	1.26	16.5 a-e	56.9 c-f
Syx6010	254 gh	146 ef	56.5 b-f	60.5	31.0 a	5.00	1.19	15.8 b-g	74.2 abc
Syx6011	260 fg	155 b-f	55.5 c-g	60.0	30.0 a	4.00	1.14	13.3 h	48.4 d-g
Syx6012	282 a-e	160 a-f	56.5 b-f	60.5	31.5 a	4.50	1.20	15.8 b-g	50.8 c-g
Syx6013	271 b-g	167 a-d	55.5 c-g	60.0	31.0 a	4.00	1.16	15.3 b-h	24.2 hi
Syx6014	254 gh	141 fg	54.0 fg	60.0	29.5 a	4.50	1.31	16.8 a-d	87.2 a
Syx6015	290 ab	173 ab	58.5 ab	61.0	29.5 a	4.00	1.17	17.3 ab	32.0 ghi
Syx6016	280 a-f	161 a-f	54.5 efg	60.0	31.0 a	4.50	1.23	16.1 a-f	22.8 hi
Syx6017	251 gh	152 c-f	54.5 efg	60.0	30.0 a	4.00	1.42	16.5 a-d	48.9 d-g
Syx6018	261 efg	151 c-f	54.5 efg	60.0	31.5 a	5.00	1.28	13.1 h	33.5 f-i
Syx6019	298 a	178 a	58.5 ab	61.0	29.5 a	4.00	1.13	16.0 a-f	35.4 f-i
Syx6020	280 a-f	178 a	57.0 a-e	60.5	32.0 a	4.00	1.22	14.8 d-h	34.4 f-i
Syx6021	267 d-g	159 a-f	58.0 abc	61.5	18.5 b	4.00	1.00	18.0 a	33.8 f-i
Syx6022	265 d-g	159 abc	59.5 a	61.5	19.5 b	4.50	0.92	15.3 b-h	38.8 f-i
Syx6024	288 abc	168 abc	57.0 a-e	62.0	31.5 a	4.00	0.98	14.9 c-h	17.5 i
Syx6025	234 h	125 g	53.0 g	60.0	30.0 a	4.50	1.30	16.0 a-f	68.2 bcd
Syx6026	262 efg	141 fg	59.5 a	61.0	28.5 a	4.50	1.32	15.3 b-h	82.6 ab
Hybrid 3 (check)	271 b-g	163 a-e	57.5 a-d	61.0	32.0 a	5.00	0.94	18.1 a	42.2 e-h
Grand Mean	268	157	56.2	60.5	29.6	2.07	1.18	15.6	47.4
F-test	**	**	**		Ns	ns	ns	**	**
CV (%)	3.34	5.23	1.91		3.91	4.57	14.1%	5.92	13.7

Means within the same column followed by the same letter are not different at 5% level of significance. Subjective evaluation of uniformity; score 5= excellent, 3= moderate and 3= poor uniformity.

Table 3. Yield components and horticultural characters of 24 sweet corn hybrids in a preliminary evaluation trial. AVRDC-ARC, Kasetsart University, Nakhon Pathom, Thailand, December 2005-March 2006.

Line	Ear length (cm)	Ear diameter (cm)	Productive ear length (cm)	Core diameter (cm)
Syx6001	18.6 a-d	4.56 a-f	17.2	2.69 a-d
Syx6002	18.1 cd	4.60 a-f	16.0	2.46 a-e
Syx6003	18.6 a-d	4.82 a-d	17.5	2.72 abc
Syx6004	19.6 a-d	5.00 ab	17.0	3.00 a
Syx6005	20.4 ab	4.36 c-f	17.2	2.50 a-e
Syx6007	17.8 d	4.13 fg	15.6	2.06 e
Syx6009	18.8 a-d	5.12 a	16.4	3.04 a
Syx6010	18.6 a-d	4.89 abc	17.4	2.78 ab
Syx6011	18.2 bcd	4.08 fg	16.1	2.15 cde
Syx6012	19.4 a-d	4.80 a-e	16.6	2.89 ab
Syx6013	20.5 a	4.29 def	16.6	2.38 b-e
Syx6014	18.8 a-d	4.76 a-e	18.4	2.89 ab
Syx6015	20.8 a	4.40 c-f	17.4	2.60 a-e
Syx6016	20.0 a-d	4.42 b-f	16.8	2.40 b-e
Syx6017	19.1 a-d	4.60 a-f	17.8	2.59 a-e
Syx6018	18.1 cd	4.60 a-f	16.1	2.73 abc
Syx6019	17.8 d	4.36 c-f	15.4	2.75 ab
Syx6020	19.4 a-d	4.06 fg	16.1	2.56 a-e
Syx6021	20.0 a-d	4.58 a-f	17.8	2.58 a-e
Syx6022	19.8 a-d	4.22 efg	16.2	2.12 de
Syx6024	19.6 a-d	3.70 g	15.0	2.12 de
Syx6025	20.0 a-d	4.94 abc	17.8	3.00 a
Syx6026	20.4 abc	4.56 a-f	18.0	2.58 a-e
Hybrid 3 (check)	20.6 a	4.85 a-d	17.5	2.72 abc
Grand mean	19.29	4.53	16.81	2.60
F-test	*	**	ns	**
CV (%)	4.86	5.31	7.06	9.24

Means within the same column followed by the same letter are not different at 5% level of significance.

The organoleptic data in table 4 showed that there were significant differences among hybrids. The brix reading of the hybrids was not significantly better than check, but among the hybrids SYX 6020 has highest brix of 17.20. The results of this trial were confirmed with results of research was conducted on growth, yield and sugar content of different varieties of sweet corn and harvest time The sugar content of hybrid varieties is higher than local ones (12).

Quality components

None of the hybrids sweetness is significantly better than check, but among the hybrids SYX 6009, SYX 6016 and SYX 6025 at 1.00, 1.00 and 1.00 are more sweetness with bicolor significantly different than other hybrids. The organoleptic tests showed that bi-colored hybrids were sweeter than the hybrids with single yellow collar.

Table 4. Organoleptic test and horticultural characters of 24 Sweet corn hybrids in a preliminary evaluation trial. AVRDC-ARC, Kasetsart University, Nakhon Pathom, Thailand, Dec. 2005- March, 2006.

Line	Sweetness	Easy eating	Color after cooking	Brix	Color of fresh grain	Grain color after cooking
Syx6001	2.50 abc	3.50 ab	3.00	14.9 b-e	Bicolor	Pale yellow
Syx6002	2.50 abc	3.00 abc	2.50	14.5 de	Bicolor	Pale yellow
Syx6003	2.50 abc	2.00 bcd	2.50	15.1 b-e	Bicolor	Pale yellow
Syx6004	1.50 bc	2.00 bcd	2.50	15.1 a-d	Bicolor	Pale yellow
Syx6005	2.00 bc	2.50 a-d	2.50	16.1 a-d	Bicolor	Pale yellow
Syx6007	4.50 a	3.00 a-d	3.50	16.3 a-d	Bicolor	Pale yellow
Syx6009	1.00 c	1.50 cd	1.50	15.6 a-d	Bicolor	Pale yellow
Syx6010	2.00 bc	2.00 bcd	2.50	16.2 a-d	Bicolor	Pale yellow
Syx6011	3.50 ab	3.00 a-d	3.00	15.7 a-d	Bicolor	Pale yellow
Syx6012	1.50 bc	2.00 bcd	2.00	15.2 b-e	Bicolor	Medium
Syx6013	3.50 ab	4.50 a	3.50	15.8 a-d	Yellow + Bicolor	Pale yellow
Syx6014	2.00 ab	2.50 a-d	3.50	15.5 a-d	Bicolor	Pale yellow
Syx6015	2.00 bc	1.50 bcd	3.00	16.6 ab	Bicolor	Pale yellow
Syx6016	1.00 c	2.50 a-d	3.50	14.6 cde	Bicolor	Pale yellow
Syx6017	1.50 bc	2.00 bcd	4.00	13.6 e	Bicolor	Pale yellow
Syx6018	1.50 bc	2.50 a-d	3.00	14.9 b-e	Bicolor	Pale yellow
Syx6019	1.50 bc	2.50 a-d	3.00	16.4 abc	Bicolor	Pale yellow
Syx6020	1.75 bc	2.50 a-d	3.00	16.5 ab	Yellow + Bicolor	Medium
Syx6021	2.00 bc	1.50 bcd	2.00	15.3 b-e	Bicolor	Deep yellow
Syx6022	3.00 abc	3.00 a-d	4.00	14.1 b-e	Yellow	Medium
Syx6024	2.50 abc	2.50 a-d	2.00	15.6 a-d	Yellow + Bicolor	Medium
Syx6025	1.00 c	1.00 d	1.00	14.7 cde	Yellow	Medium
Syx6026	2.00 bc	2.00 bcd	3.00	17.2 a	Yellow	Deep yellow
Hybrid 3 (check)	2.50 abc	1.50 bcd	2.00	16.5 ab	Bicolor	Medium
Grand Mean	2.14	2.35	2.75	15.6		
F-test	*	*	Ns	*		
CV (%)	28.9	26.4	25.2	4.64		

Means within the same column followed by the same letter are not different at 5% level of significance. Subjective evaluation of sweetness; score 1= excellent, 3= moderate and 5= poor sweetness.

Conclusion and Recommendation

The result of the experiment has shown that, check (hybrid 3) is appropriate variety for sweet corn based on high total yield, good marketable yield and good quality (sweetness). Also among hybrids, SYX 6014 line has highest marketable yield with sugary enhanced. It is mentionable that SYX 6014 hybrid line is also one of the appropriate varieties. Among all hybrids and check the SYX 6009, SYX 6016 and SYX 6025 are super sweet than other lines and appropriate varieties at Nakhon Pathom, Thailand.

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