Kasetsart J. (Nat. Sci.) Vol. 24 : 208 - 217 (1990)

Research and Development of Sweet Corn and Baby Corn for Fresh Consumption and Processing

Tavat Lavapaurya, Pramote Saridniran[1], Surapol Chowchong Prachoom Juthawantana, Suranee Thongleung, Yupapan Chuthathong[2] and Kulvadee Trongpanich[3]

ABSTRACT

The sweet corn and baby corn breeding project, Kasetsart University, initially produced a new open pollinated variety of Supersweet corn, " Supersweet DMR " in 1975. This open-pollinated (OP) variety had to be urgently made to provide a variety with moderate downy mildew resistance to replace local varieties which could not grow in the ordinary rainy season.

" Thai Supersweet Comp. # 1 DMR " is another OP variety having an even higher downy mildew resistance level and was released to the public in 1979. This variety gives high quality young ear corn and is best for fresh ear consumption as sweet corn. European and Japanese markets impose high standards of young ear corn exported from Thailand.

Hybrid single cross 27127 or HS27127 was first accomplished by this project in 1982, aiming at processing and fresh produce markets. Malee Processing Co,Ltd accepted it for making canned cream style corn in 1987 and has been using it since then. While Daily Foods Co,Ltd. had employed the variety for processing both cream style corn and canned whole kernels since 1988.

INTRODUCTION

Galinat succeeded in producing silkless baby corn in 1985. The genetic system to do this is based on the use of two different recessive genes for the tassel-seed trait *(ts2 and ts1)* on chromosomes 1 and 2 respectively as silk restorers for the silkless gene *(sk)*, also on chromosome 2. The double mutant *sk sk, ts2 ts2* and *sk sk, ts1 ts1* with selection for a normal sexual balance, functions as normal corn. The double, hybrid *Ts2 ts2, Ts1 ts1, sk sk* between these two double mutants is 100% silkless because each parent carries the normal dominant allele that masks the recessive tassel-seed gene in the other parent. Troyer (1985) utilized donor inbred lines crossed with female inbred ; donor inbreds are used as a female to incorporate cytoplasmic male sterility. Donor inbreds are developed with chromosomes which function in hybrid plant development (sporophyte) but do not take part in seed development (gametophyte) i.e. to take part in mitosis but not in meiosis. The donor inbred lines female inbred seedstock is grown as the female. The male inbred seed stock is grown as the male. The single cross hybrid seed is produced in the usual way. Seed yields are increased while the quality is improved. (Pupompan *et. al.* 1983) Some-time planting of male and female in the production field is acheived. Fewer seedstocks for sterile conversion are necessary in foundation seed.

Thai farmers were then obstructed by a major disease of corn downy mildew which com-

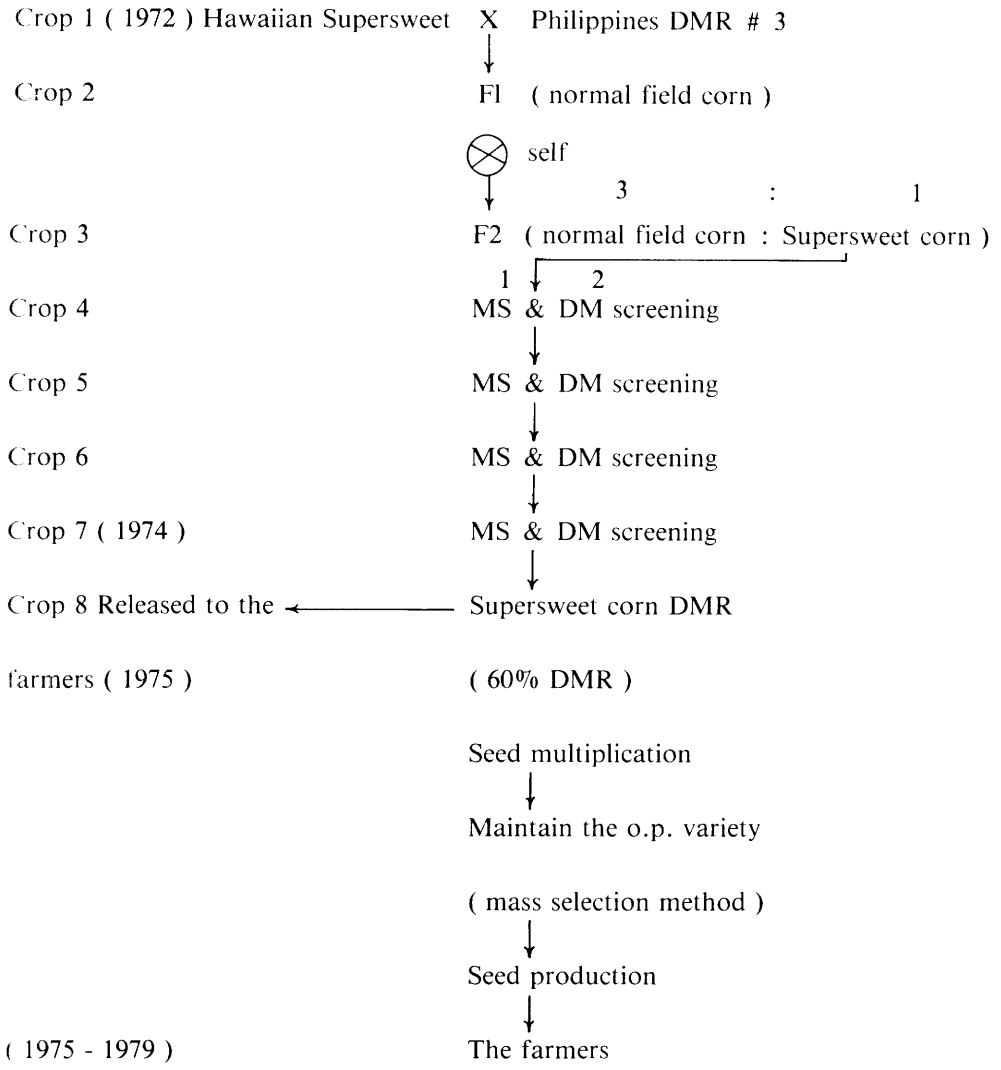
1 Dept. of Horticulture, Faculty of Agriculture, Kasetsart University, Bangkok 10900, Thailand.
2 National Corn and Sorghum Research Centre, Kasetsart University, Nakhon Ratchasima, Thailand.
3 Institute of Food Research and Product Development, Kasetsart University, Bangkok, 10900, Thailand.

pletely infected their vegetable corns throughout the rainy season. (Bussbongprivan, 1988). In 1972 " The supersweet corn DMR " was first started by the sweet corn and baby corn breeding project, Kasetsart University, and the first achievement came at the end of 1975. (Saritnirand, 1987). The variety was 60% downy mildew resistant.

This ' supersweet DMR ' variety had replaced those local varieties of corn, in such a serious season very well for the period of time in Thailand.

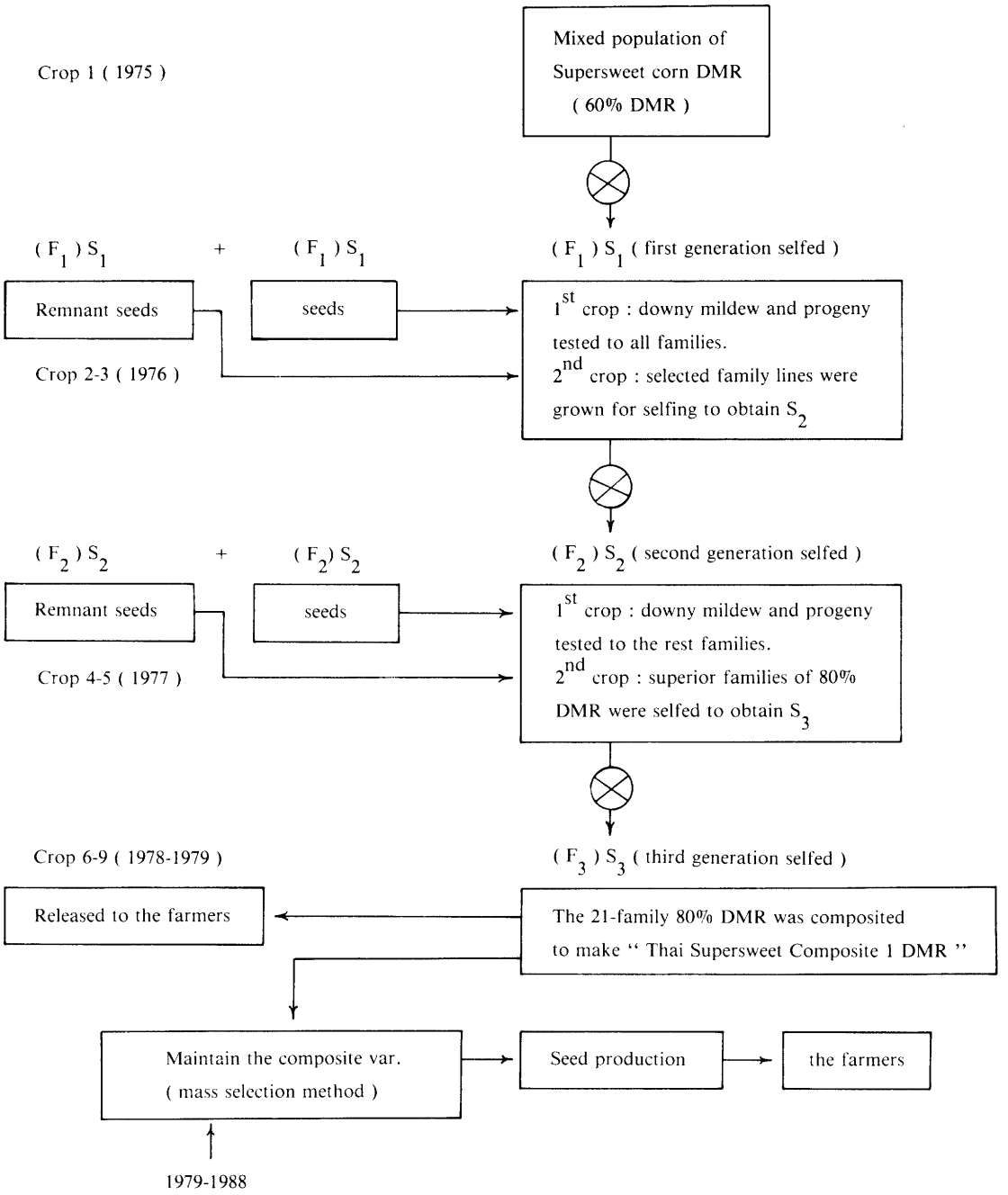
MATERIALS AND METHODS

I The development of " Supersweet corn DMR " had been done as a model below :-

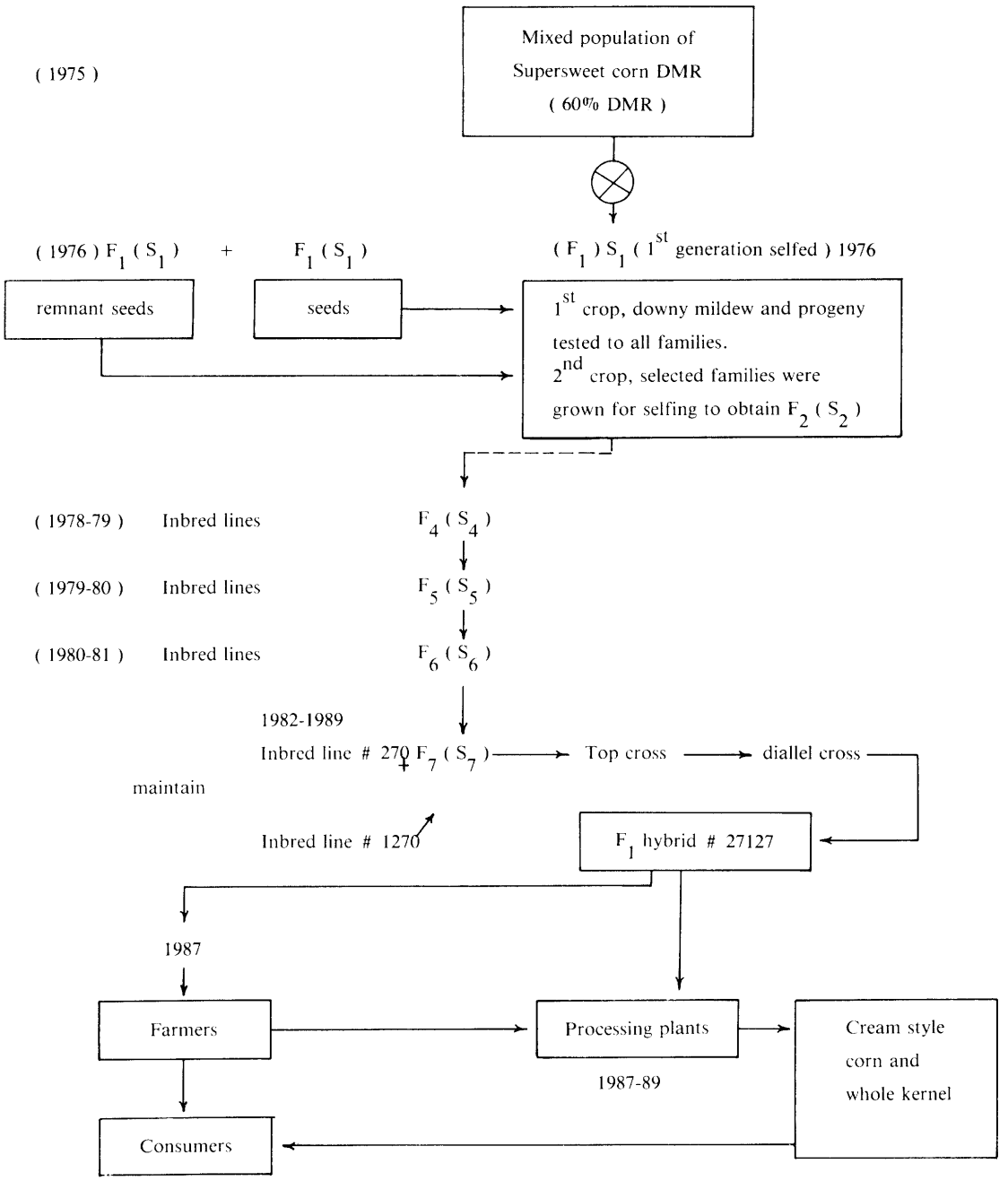


1 Mass selection
2 Downy mildew screening
3 Downy mildew resistance

II The development of " Thai Supersweet corn comp. # 1 DMR "



III The development of " Thai Supersweet corn F_1 Hybrid # 27127



RESULTS

The Suwan Farm, Kasetsart University, had successfully grown the F_1 hybrid # 27127 for 2 rai (0.32 ha) every day for 55 days to cover the whole area of 104 rais (16.6 ha) from July 17-Sept. 10, 1987. Most of the produce was shipped to Malee Processing Co., Ltd. for making cream style corn. Harvested fresh produce of 188 tons was sold out at a value of $ 18,532.2. Cost production of produce was $ 11,819.4 given the net profit $ 6712.8.

Performances of the F_1 hybrid # 27127 grown in 16.6 ha at Farm Suwan from July 17-Sept. 10, 1987 are given in details below.

1) Harvested fresh produce average per rai (5,789 ears) = 1,133 kg
2) Age of 50% silking date = 53 days
3) Harvested date of produce = 69 days
4) Ear height = 106 cm
5) Plant height = 195 cm

Thai Supersweet Comp # 1 DMR is one of the most popular baby corn varieties of Thailand and is now used for processing in the canning industry. Large quantities of its fresh produce are air-lifted to foreign markets all year round.

DISCUSSION

Supersweet DMR was the first open pollinated variety of sweet corn cultivar improved in Thailand in 1975 by Kasetsart University Sweet Corn Breeding Project. Its kernel suger content was double that of other normal sweet corn at that time. Its was also the first vegetable corn of Thailand to carry about 60% resistance to corn downy mildew. Four years later, another o.p. variety, " Thai Supersweet comp. # 1 DMR ", with a level of up to 80% downy mildew resistance was developed by the same project, it was then released to the farmers in 1979. This o.p. variety has been popularly used to produce baby corn for both fresh and canned produce since 1979.

Table 1 Performances and yield trial between Thai Supersweet Comp # 1 DMR and introduction of exotic sweet corns at Kamphaeng Saen campus, Kasetsart University, in 1983-84.

Varieties	Ear weight with husk (g)	Ear			Sweetness (°brix)	Tenderness (kg)
		Diameter (mm)	Length (cm)	Height (cm)		
Sky Liner 85	112.8f*	40.8cd	15.7d	32.8e	13.7bc	2.57b
Sky Liner 95	203.3a	45.3a	20.0a	64.2c	13.9bc	2.50b
Jerry Bantam	121.2f	39.7d	17.0c	45.9d	12.8c	2.21c
Honey Comb	142.3e	41.7c	18.0b	43.3d	21.0a	2.17c
Milky 100	165.8c	40.6cd	20.0a	67.9b	15.0b	2.50b
Partner Sweet	180.9b	43.7b	17.0c	63.6c	12.8c	2.48b
Thai Supersweet Comp # 1 DMR	154.2d	41.5c	18.5b	105.1a	13.9bc	2.72a

* Means within the same parameter followed by a common letter are not significantly different at the 5% level by Duncan's Multiple Range Test.

Table 2 Performances and yield trial between HS 27127, HS 3353 and introduction of exotic sweet corn at Kamphaeng Saen campus, Kasetsart University, in 1985.

Varieties	Fresh Produces (kg/40 plants)	Ear wt. with husk (g)	Ear diameters (mm)	Ear length (cm)	50% silking date (days)	Sweetness (°brix)	Ear height (cm)	Plant height (cm)
Sky Liner 95	9.9a	246.8a	48.0a	20.9b	50d	17.4b	84.4c	200.53b
Partner Sweet	8.4b	211.2b	46.5b	18.3c	50d	17.7b	74.5d	157.91c
Milky 100	9.4a	188.3c	47.6ab	17.0d	43e	19.4a	33.8c	110.63d
Jupiter	7.5b	236.7a	48.3a	18.9c	51d	17.0bc	75.2d	161.50c
Thai-HS3353	9.6a	239.5a	45.5b	23.0a	62a	17.6b	124.6b	214.06ab
Thai-HS 27127	9.7a	241.4a	48.3a	20.5b	60b	16.7b	120.7b	208.42ab
Thai Supersweet Comp # 1 DMR	8.0b	201.1bc	44.7b	20.3b	58c	17.0bc	135.6a	235.7a
C.V. (%)	4.8	0.79	2.6	2.21	1	0.53	3.6	1.4

The different letters showed significant difference at 5% level in Orthogonal comparison.

Table 3 Performances and yield trial between Thai-HS27127, Thai Supersweet Comp. # 1 DMR and introduced exotic sweet corn conducted at Farm Suwan, Kasetsart University in April-June, 1986.

Varieties	Fresh produces (kg/ha)	Ear weight unhusked (kg/ha)	Ear diameter (mm)	Ear length (cm)	50% silking date (days)	Harvested date (days)
Thai-HS27127	11,019	7,681	42	19.0	55	75
Top Sweet *	0	0	0	0	0	0
Super Agro	8,475	6,031	44	17.5	56	76
Thai Supersweet Comp # 1 DMR	9,043	5,931	42	17.8	55	72
Mean	7,138	4,906	32	13.6	42	56

* Top Sweet is an exotic sweet corn thus which could not grow during April-June, 1986. All plants died at about 30 days.

Table 4 Performances and yield trial of HS27127, TSC # 1 DMR and exotic sweet corns, Farm Suwan, Nakhon Ratchasima province, Kasetsart University, June-Sept. 1986.

Varieties	Fresh produces (kg/ha)	Ear weight average (unhusked) (kg/ha)	Ear		Sweetness (°brix)	50% silking date (days)	Height (cm)		Harvesting date (days)
			diameter (mm)	length (cm)			Ear	Plant	
Thai-HS27127	11,856	8,138	44.8	16.3	17.0	55	90	164	76
Top Sweet	3,519	1,163	22.0	8.4	14.0	32	40	76	53
Super Agro	9,044	6,163	45.4	16.21	15.3	56	87	159	76
Thai Supersweet Comp # 1 DMR	10,106	6,213	32.4	16.0	15.4	55	94	174	76
Mean	8,631	5,419	36.0	14.2	15.4	50	78	143	70

Table 5 Quality rating of baby corn hybrid including Thai Supersweet comp. # 1 DMR in can. The canning products were rated and evaluated by 29 persons as following.

Varieties product tested	Rating of product appearante	Rating			Texture	Organoleptic properties
		Color	Odor	Taste		
1) Thai Baby corn Comp. # 1 DMR	2.9	4.1	5.5	6.2	4.7	4.68
2) Single cross (182 × 200)	4.2	5.8	6.1	5.9	5.5	5.50
3) Double cross (85 × 200) × (166 × 182)	6.0	6.2	5.0	4.3	5.9	5.48
4) Three way cross (200 × 182) × 41	5.7	6.3	6.6	5.6	6.2	6.08
5) Thai Supersweet Comp. # 1 DMR	8.4	6.8	4.1	3.7	6.2	5.84

Remark 1) Rating scores are 1-9 (Hedonic scale method)

1 = Extremely dislike 2 = dislike very much 3 = very dislike
4 = dislike 5 = neither dislike or like 6 = a little like
7 = medium good 8 = like very much 9 = Extremely like

F_1 hybrid single cross # 27127 was the first cultiver developed by this project in 1982 aiming at utilizing its fresh produce for canning, freezing and fresh markets. This hybrid variety was well accepted by two processing plants, Malee Processing Co. Ltd. in 1987 and Daily Food Co. Ltd. in 1988. And is still used by them both its fresh produce can be processed in both canned cream style corn and canned whole kernels.

CONCLUSION

The sweet corn and baby corn project, National Corn and Sorghum Research Center, Kasetsart University succeeded in synthesizing both the open pollinated varieties of supersweet downy mildew resistant corn " Supersweet DMR ", in 1975 and " Thai Supersweet Comp. # 1 DMR in 1979. The second op. variety is now popularly used for baby corn production within the country.

The single cross hybrid # 27127 is the latest F1 hybrid variety developed by the project. It was effectively formed in 1982. Its produce has been accepted by two processing companies; Malee Processing Co. Ltd, has been using the young kernels for making canned cream style corn since 1987. Daily Foods Co.Ltd, has been processing both canned cream style corn and canned whole kernels since 1988.

Figure 1. HS 27127

Figure 2. HS 27127

Figure 3. HS 27127

Figure 4. HS 27127 and Top Sweet

LITERATURE CITED

Bussbongprivan, S. 1988. Baby corn variety trial for canning, Special Problem, Dept. of Horticulture, Kasetsart University. 15 p. (in Thai)

Galinat, W.C., 1985. " Silkless baby corn, seed production genetic ", Maize Genetic Cooperation Newsletter No. 59, Dept. of Agronomy and USDA, University of Missouri-Columbia, U.S.A.

Pupompan, P., M.L.A. Choomsai, and E. Nawata, 1983. Comparison of some Characteristics among composite and F1 hybrid varieties in sweet corn, Annual Report of Vegetable Seed Production, Central laboratory, Kasetsart Univ., Kamphang Saen Campus, Nakon Pathom, Thailand. p. 12-24.

Saritnirand, P. 1987. Selection of Thai Supersweet Comp. # 1 DMR by S1 recurrent selection cycle I. MS thesis, Graduate School, Kasetsart University. 88 p. (in Thai)

Troyer, A. 1985. " Producing single cross seed corn on hybrid plant, " Dekalb, Illinois, Maize Genetics Cooperation Newsletter No. 59 : 48 Dept. of Agronomy and USDA, University of Missouri-Columbia, U.S.A.