

THE EVALUATION OF THE IITA AND CIAT CLONES AND PROGRESS ON THAI CMD RESISTANT BREEDING

5/10/2023

Chalermpol Phumichai, Ed Sarobol, Chareinsuk Rojanaridpiched, VichanVichukit, Wannasiri Wannarat, Wanwisa Siriwan, Pasajee Kongsil, PiyaKittipadakul, Piyaporn Nathaisong, Thapakorn Jaisuwan

Cassava Team



Breeding



Ed Sarobol



Chalernpol Phumichai



Piya Kittipadakul



Pasajee Kongsil

Virology



Wanwisa Siriwan

Tissue culture and seed multiplication



Wannasiri Wannarat



Vichan Vichukit



Chareinsuk Rojanaridpiched



Piyaporn Nathaisong

Sources of resistance to CMD available from IITA and CIAT were introduced to Thailand



Year	Source	Plant materials
2013	CIAT, Colombia	TME3, C33
2018	IITA, Nigeria	IITA-TMS-IBA980505, IITA-TMS-IBA972205, IITA-TMS-IBA980581, IITA-TMS-IBA920057, TMEB419
2020	CIAT, Hawaii	3,765 F1 Seeds
2021	CIAT, Colombia	32 CMD Resistant Clones
2023	CIAT, Colombia	655 F1 Seeds

Yield, percentage of starch content and disease incidence between cassava varieties

No	Variety	Germination (%)	High (cm)	Fresh root yield (kg/rai)	Starch Content (%)	Disease Incidence (%)
1	HB90	93.7 ab	165 bcd	4,165 a	23.6 a	74.78
2	HB60	94.8 ab	169 abcd	3,855 a	20.1 abc	29.66
3	#89	97.9 a	141 ef	3,728 a	16.8 cd	81.87
4	KU50	95.8 a	161 cd	3,708 a	20.5 ab	17.37
5	HB80	100.0 a	170 abcd	3,535 ab	22.7 a	74.93
6	R72	100.0 a	179 abc	3,418 ab	17.6 bcd	54.02
7	R1	97.2 a	183 ab	2,533 bcd	14.4 d	43.54
8	TME3	87.5 ab	140 ef	2,110 cd	14.9 d	56.02
9	C33	82.2 b	152 de	1,625 d	14.0 d	0
10	R11	100.0 a	181 ab	1,598 d	22.7 a	97.5
	Mean	91.6	162.7	2,842	19	
	F-test	**	**	**	**	
	CV	9.08	7.23	24.46	12.05	



Cassava yield trial on 11 experiments during 2020-2023



First IITA resistance cassava yield trial 2020/2021

01

IITA varietal trial at Sa kaeow province
(15.1577° N, 101.5050° E)



Plantlets derived from plant tissue culture

IITA resistance cassava yield trial 2021/2022



02

IITA varietal trial at TDI
(15.1577° N, 101.5050° E)

03

**IITA varietal trial at
Suwan Farm**
(14.6522° N, 101.3110° E)

04

**IITA varietal trial at
Soeng Sang district**
(14.3723° N, 102.4839° E)

05

**IITA varietal trial at Sa kaeow
province (early season)**
(15.1577° N, 101.5050° E)

06

**IITA varietal trial at Sa kaeow
province (late season)**
(15.1577° N, 101.5050° E)

IITA resistance cassava yield trial

2020-2022

Average yield trial on 6 experimental

Variety	Yield (kg/rai)	Starch content (%)	Disease severity (%)
TMEB419	3,676	23.7	-
IITA-TMS-IBA980581	3,896	16.8	0
IITA-TMS-IBA920057	2,629	19.2	0
KU50	4,950	24.4	48.7

07

IITA varietal trial at TDI

(15.1577° N, 101.5050° E)

08

IITA varietal trial at Suwan Farm

(14.6522° N, 101.3110° E)

09

IITA varietal trial at Nong Yai district

(13.1286° N, 101.3658° E)

10

IITA varietal trial at Khao Hin Sorn Research Station

(13.7476° N, 101.5651° E)

11

IITA varietal trial at Soeng Sang district

(14.3723° N, 102.4839° E)

IITA resistance cassava yield trial 2022/2023



IITA resistance cassava yield trial

2022/2023



TMEB419



IITA-TMS-IBA920057



IITA-TMS-IBA980581

Seven months old at farmer field Nong Yai district, Chonburi province



TMEB419 ten months old at farmer field
Nong Yai district, Chonburi province





IITA-TMS-IBA920057 ten months old
at farmer field Nong Yai district,
Chonburi province



IITA-TMS-IBA980581 ten months old
at farmer field Nong Yai district,
Chonburi province



IITA resistance cassava yield trial

2022/2023

Average yield trial on 5 experimental

Variety	Yield (kg/rai)	Strach content (%)	Disease severity (%)
TMEB419	5,080	26.2	2
IITA-TMS-IBA980581	5,037	21.4	0
IITA-TMS-IBA920057	3,755	22.1	4
KU50	4,981	25.1	52
HB90	5,979	28.0	91
HB100	7,209	27.2	78

IITA resistance cassava yield trial 2023/2024

12

IITA varietal trial at Suwan Farm
(14.6522° N, 101.3110° E)

13

IITA varietal trial at Khao Hin Sorn Research Station
(13.7476° N, 101.5651° E)

IITA resistance cassava yield trial

2023/2024



TMEB419



IITA-TMS-IBA920057



IITA-TMS-IBA980581

Three months old at farmer field Suwan Farm, Nakhon Ratchasima province

IITA resistance cassava yield trial 2023/2024



Susceptible variety

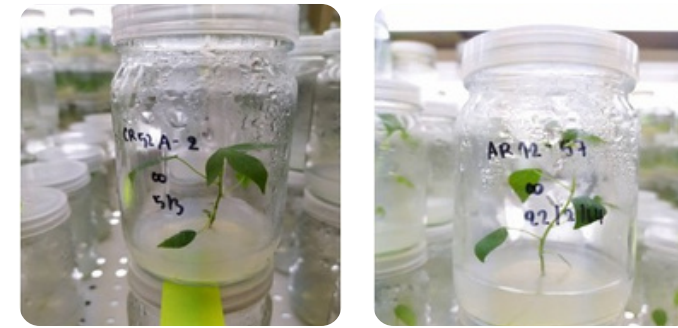


TMEB419

Six months old at Khao Hin Sorn research station

32 CIAT CMD resistant clones

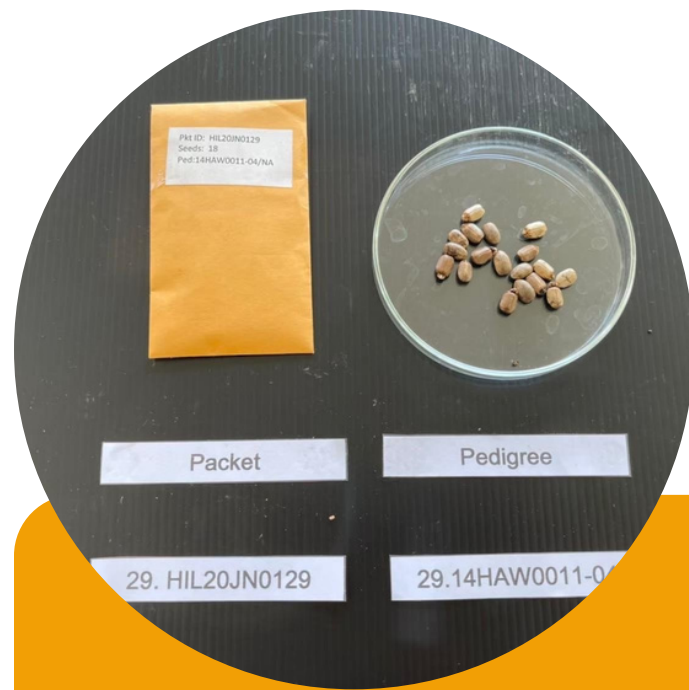
Entry	Genotype	Mother	Father	Purpose	No. Tubes/Bags	No. Plants
1	AR9-12	C-243	CW257-12		2	10
2	AR9-14	C-243	CW257-12		2	10
3	AR11-12	C-243	CW259-43		1	5
4	AR12-11	C-33	CW234-2		2	10
5	AR12-57	C-33	CW234-2		2	10
6	AR14-2	C-33	CW257-10		2	10
7	AR14-3	C-33	CW257-10		2	10
8	AR17-3	C-33	CW258-17		2	10
9	AR17-18	C-33	CW258-17		2	10
10	AR17-23	C-33	CW258-17		2	10
11	AR18-1	C-377	CW257-12		2	10
12	AR23-1	C-39	CW259-43		2	10
13	AR35-1	C-243	CW257-10		2	10
14	AR37-38	C-33	CW259-42		2	10
15	AR37-103	C-33	CW259-42		2	10
16	AR40-3	C-39	CW259-42		2	10
17	AR40-5	C-39	CW259-42		2	10
18	AR40-19	C-39	CW259-42		2	10
19	AR42-3	C-413	CW259-42		2	10
20	AR42-4	C-413	CW259-42		2	10
21	CR13-8	COL 1734	C-33		2	10
22	CR24-3	CM7951-5	C-18		2	10
23	CR24-16	CM7951-5	C-18		2	10
24	CR25-4	CM7951-5	C-33		2	10
25	CR27-20	CM7951-5	C-243		2	10
26	CR52A-2	C-243	SM1219-9		2	10
27	CR52A-4	C-243	SM1219-9		2	10
28	CR60B-10	C-18	TAI 8		2	10
29	CR61A-1	TAI 8	C-33		2	10
30	CR100-2	OW 181-2	C-377		2	10
31	CR100-5	OW 181-2	C-377		2	10
32	CR100-9	OW 181-2	C-377		2	10
					63	315



Preliminary yield trials

- **CR13-8**
- **CR24-16**
- **CR52A-4**

3,765 cassava seeds from Hawaii



- 1,213 germinated (32.2%)
- 1,194 seedlings



- Preliminary yield trials (PYT)
8 clones
- Plant type, disease severity
(0%)

655 F1 Seeds from CIAT

- 65 germinated (9.92 %), 15 seedlings



Breeding for CMD resistance

CMD resistance materials

1. C33
2. IITA-TMS-IBA980505
3. IITA-TMS-IBA972205
4. IITA-TMS-IBA980581
5. IITA-TMS-IBA920057
6. TMEB419



Commercial varieties



- Plant type, HI, Yield (seedling Stage)
- CMD markers screening (Single row trial)
- Preliminary yield trials (PYTs)

Year

- 2020
- 2021
- 2022
- 2023

Crosses between

HNT and C33



Asst. Prof. Pasajee Kongsil, Ph.D.

Crosses between HNT and C33



Hanatee Variety

CMD tolerant variety

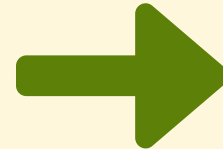


C33 Variety

CMD resistant variety

2020/2021

Crossing of HNT x C33, C33 xHNT



HNT x C33: 240 flowers -> 147 seeds
C33 x HNT: 245 flowers -> 299 seeds

2021/2022

Seedling trial



HNT x C33: 51 seedlings (32% germination)
C33 x HNT: 213 seedlings (71% germination)

2022/2023

Single row trial



CMD severity score

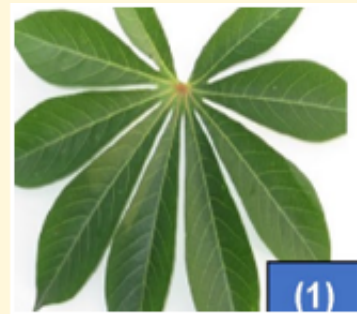
2023/2024

Preliminary trial



Single row trial and CMD severity score

Chi-square test of CMD resistant trait in F1 Population of Cassava Crosses between Hanatee and C33 Variety in 2022/2023



Ratio(Genotype)	6 (AaBbCc, AaBbcc, AabbCc, Aabbcc, aaBbCc, aaBbcc)	1 (aabbCc)	1 (aabbcc)
Observed value	55	8	4
Expectedvalue	50.25	8.38	8.38

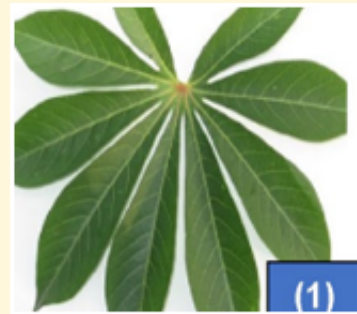
P-value = 0.25

Hypothesis

CMD resistant locus in C33 -> Aa

CMD tolerant loci in Hanatee -> Bb and Cc

Chi-square test of CMD resistant trait in F1 Population of Cassava Crosses between Hanatee and C33 Variety in 2023/2024



Score 1

Score 2

Score 3



Ratio(Genotype)	4 (AaBbCc, AaBbcc, AabbCc, Aabbcc)	3 (aaBbCc, aaBbcc, aabbCc)	1 (aabbcc)
Observed value	68	38	8
Expectedvalue	57	42.75	14.25

P-value = 0.067

Hypothesis

CMD resistant locus in C33 -> Aa

CMD tolerant loci in Hanatee -> Bb and Cc

Our Activities



Breeding for CMD resistance TME3
C33 and five IITA varieties were
provided in cutting and plantlets
and given to DOA in 2020



Our Activities



Three IITA varieties were delivered in cutting to TTDI in 2023



Cassava Field Day

at TDI on 8/30/2023



Acknowledgements



TTDI



Australian Government

Australian Centre for
International Agricultural Research



THANK YOU