002-16

# Selection of two sweet potato (Ipomea batatas Lam.) varieties adapted to the Caribbean coast of Colombia

**Amparo Rosero, Iván Pastrana, Carlos Sierra, José Luis Pérez, Laura Espitia, Remberto Martínez, Hernando Araujo**
Roots and Tubers Research Group, Corporación colombiana de investigación agropecuaria - AGROSAVIA, Colombia
Contact email: erosero@agrosavia.co

AGROSAVIA
Corporación colombiana de investigación agropecuaria

GOBIERNO DE COLOMBIA · MINAGRICULTURA · CORPORACIÓN CLAYUCA

## Introduction

Sweet potato is an important crop used as energy source. Its adaptation to extreme temperatures has promoted its cultivation in the Caribbean region of Colombia. However, traditional technologies are still used resulting in an unprofitable crop system. Sweet potato crop has the capacity to adapt to different environmental conditions, it is an important feature to ensure human food security in vulnerable regions (Glato, 2017).

## Materials and methods

### Plant Material

Twenty genotypes were evaluated in this study, 0113-672COR, 0113-668VAL, 0113-657VAL, 0113-664VAL, 0113-671VAL, 0113-634VAL, 0113-670VAL, 0113-660VAL, 0113-663VAL, 0113-674VAL, 0113-665VAL, 0113-659VAL, 0113-673VAL, 0113-669VAL, 0113-656COR, 0113-662VAL, 0113-658COR, 0113-666VAL and CRIOLLA was used as a check.

### Growth conditions

**Table 1.** Characteristics of localities in this study

| Environment | Year | Agroecological zone cod* | Landscape | Climate | Municipality | Additional information |
|---|---|---|---|---|---|---|
| Type 1 | 2015 2016 | WR17 | Plain | Warm dry | Corozal | 9°17'34.38"N, 75°20'9.00"W |
| Type 1 | 2015 2016 | WP2 | Piedmont | Warm dry | Agustín Codazzi | 10°00´01.2´´N, 73°15´22.4´´W |
| Type 1 | 2016 | WL31 | Hills | Warm dry | La Jagua del Pilar | 10°31´59.0´´N, 73°06´09.6´´W |
| Type 2 | 2015A 2015B 2016 | VR18-19 | Plain | Warm humid | Cérete | 8° 50' 27.47"N, 75° 48' 27.56´´W |
| Type 2 | 2015 2016 | WM49, WP22 | Mountains and Piedmont | Warm dry | Carmen de Bolívar | 9° 42´ 50.8"N, 75° 06´ 26.9"W |
| Type 2 | 2016 | VL35 | Hills | Warm humid | Dibulla | 11°12´45.2´´N, 73°24´20.2´´W |
| Type 3 | 2016 | WL31, WV1 | Hills and valley | Warm dry | Tolú | 09°29´21.6´´N, 075°34´12.9´´W |
| Type 3 | 2015 | WL31 | Hills | Warm dry | Riohacha | 11°07´15.05´´N, 72°59´22.87´´W |

*Source: IGAC-CORPOICA. 2013. Zonificación agroecológica de Colombia. 255-289p.

### Experimental design

Genotypes were stablished following the experimental conditions used in uniform yield test (UYT) and agronomic evaluation test (AET). Experimental units were composed by 26 and 52 plants, respectively. Randomized complete block design (RCBD) was used in this study, 3 or 4 repetitions per locality. A density of 25.000 plants/ha was used.

## Results

### Agronomic performance of genotypes evaluated in UYT

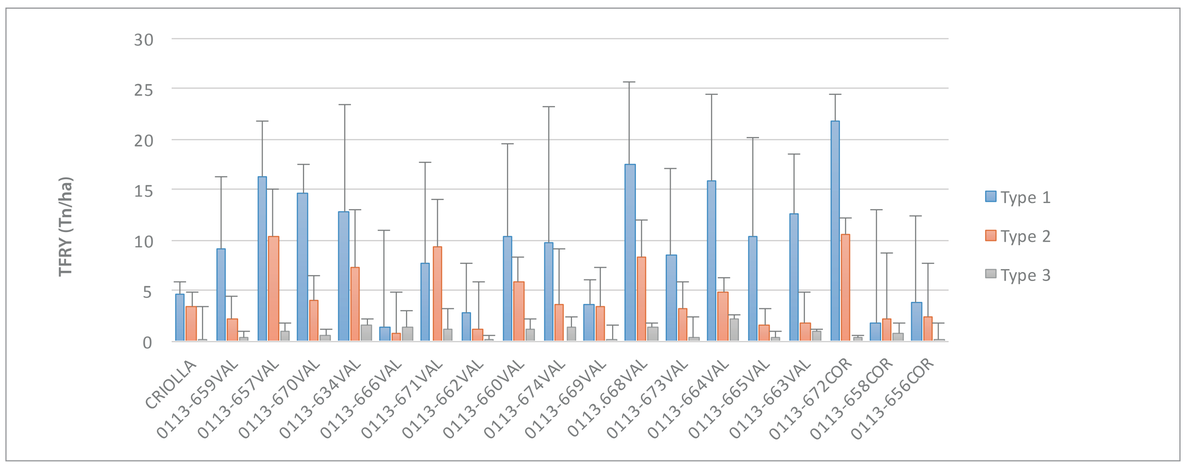


**Figure 1.** Mean total fresh root yield (TFRY) in evaluated genotypes

### Selection of promisory genotypes from UYT

**Table 1.** Selection index in all locations and combined analysis

| | Type 1 | Type 2 | | | | | Type 2 |
|---|---|---|---|---|---|---|---|
| Genotypes | General | Codazzi_2015 | Corozal_2015 | Carmen_b_2015 | Cerete_2015a | Cerete_2015b | Riohacha_2015 |
| 0113-672COR* | 26,88 | 55,12 | 29,20 | 14,63 | 16,74 | 56,10 | 4,32 |
| 0113-668VAL* | 20,16 | 21,06 | 55,01 | 11,57 | 29,07 | 43,82 | 22,04 |
| 0113-657VAL* | 19,78 | -7,59 | 33,22 | 63,29 | 32,04 | 59,70 | -1,91 |
| 0113-664VAL* | 13,13 | 35,39 | 25,31 | 21,43 | 4,21 | 2,23 | 39,71 |
| 0113-671VAL* | 8,10 | -7,28 | -1,31 | 30,14 | 22,92 | 19,24 | 9,70 |
| 0113-634VAL* | 7,64 | -5,45 | 20,46 | 3,75 | 49,62 | 16,91 | 21,07 |
| 0113-670VAL | 7,21 | 20,38 | 22,23 | 26,98 | -2,64 | -15,88 | 28,43 |
| 0113-660VAL* | 6,84 | 6,74 | -2,03 | 29,89 | 7,73 | -9,96 | 29,52 |
| 0113-663VAL | 0,72 | 26,71 | -1,15 | -13,96 | -15,86 | -14,70 | 9,18 |
| 0113-674VAL | 0,53 | 20,40 | -20,49 | -19,09 | -13,22 | -17,18 | 35,75 |
| 0113-665VAL | -0,23 | 28,08 | -13,58 | -21,05 | -16,04 | -21,35 | 1,22 |
| 0113-659VAL | -5,46 | -0,41 | 1,90 | -25,36 | -9,62 | -12,46 | -0,04 |
| 0113-673VAL | -6,26 | -0,08 | -13,38 | -15,37 | -18,50 | -10,81 | -2,57 |
| CRIOLLA(check) | -6,84 | -25,28 | | | | -12,87 | -17,32 |
| 0113-669VAL | -8,45 | -18,46 | -23,32 | -27,81 | -17,35 | -0,30 | -4,70 |
| 0113-656COR* | -13,70 | -16,79 | -23,09 | -31,58 | -11,89 | -17,24 | -13,09 |
| 0113-662VAL | -14,65 | -16,16 | -22,05 | -25,76 | -20,84 | -27,05 | 5,91 |
| 0113-658COR | -16,86 | -20,32 | -22,90 | -19,28 | -21,14 | -22,19 | 2,24 |
| 0113-666VAL | -17,72 | -31,17 | -24,63 | -21,97 | -19,50 | -24,93 | 45,06 |
| TRFY (Tn/ha) | 6,07 ± 8,12 | 11,84 ± 10,55 | 7,85 ± 9,19 | 3,41 ± 3,97 | 3,62 ± 5,02 | 5,77 ± 6,52 | 0,81 ± 1,57 |
| CFRY (Tn/ha) | 3,92 ± 5,77 | 9,13 ± 8,28 | 3,09 ± 3,97 | 2,34 ± 3,29 | 2,74 ± 4,11 | 5,16 ± 6,26 | 0,83 ± 1,63 |
| RC (%) | 8,73 ± 24,42 | 10,03 ± 24,15 | 5,27 ± 19,98 | 1,85 ± 12,56 | 7,47 ± 21,74 | 8,78 ± 23,67 | 21,53 ± 37,41 |
| SURV (%) | 64,34 ± 22,73 | 69,47 ± 22,98 | 67,48 ± 15,57 | 62,99 ± 16,80 | 70,94 ± 17,79 | 81,71 ± 13,02 | 47,77 ± 22,05 |

*Selected genotypes to be stablished in multilocal agronomic evaluation

### Agronomic performance and genotypes selection in multilocal agronomic evaluation

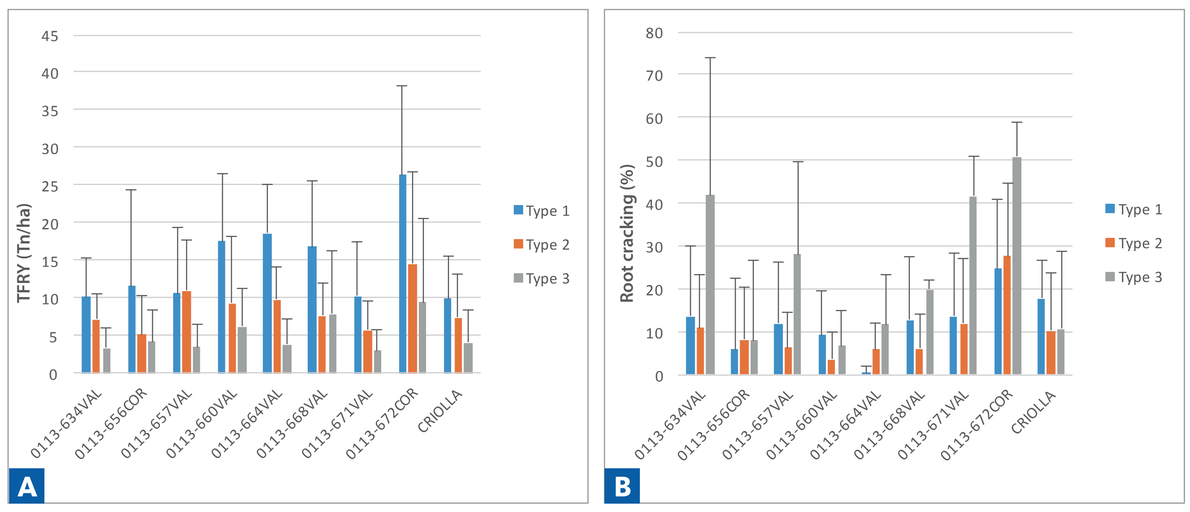


**Figure 2.** Agronomic traits in genotypes evaluated in multilocal agronomic test in three environmental type. A) Mean total fresh root yield (TFRY), B) Mean root cracking percentage.

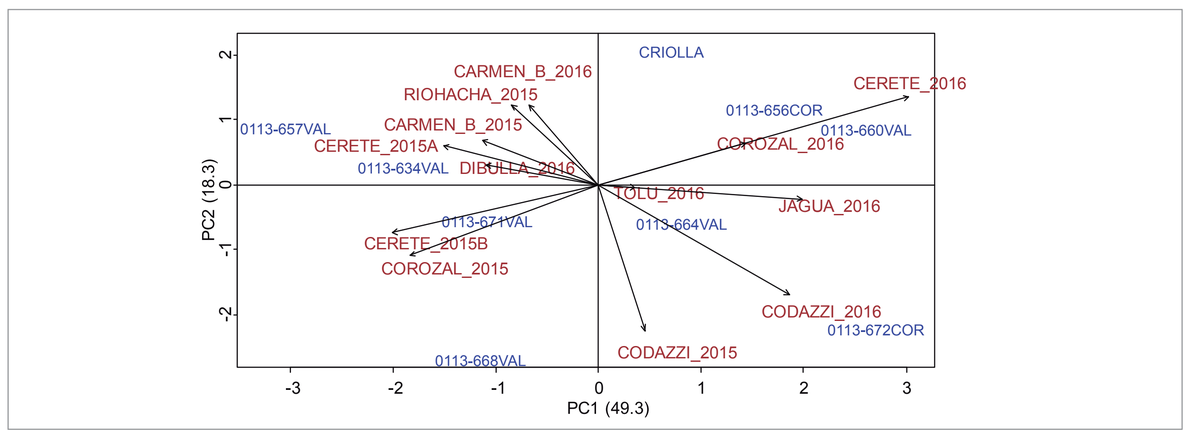


**Figure 3.** AMMI biplot for total fresh root yield in selected genotypes.

**Table 2.** Selection index in all locations and combined analysis

| | Type 1 | | | | | | Type 2 | | | | | | Type 3 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| IS locations | General | Codazzi_2015 | Codazzi_2016 | Corozal_2015 | Corozal_2016 | Jagua_2016 | Carmen_B_2015 | Carmen_B_2016 | Cerete_2015a | Cerete_2015b | Cerete_2016 | Dibulla_2016 | Riohacha_2015 | Tolu_2016 |
| 0113-672COR* | 14,8 | 49,9 | -0,5 | 19,1 | 75,5 | 26,0 | -6,1 | 33,6 | -3,6 | 33,2 | 36,4 | -48,1 | -7,6 | 9,4 |
| 0113-664VAL | 12,6 | 46,7 | 24,7 | 12,7 | 12,1 | 10,6 | 5,7 | -12,4 | -23,2 | -17,7 | 9,0 | 61,1 | 54,0 | -15,9 |
| 0113-657VAL | 9,9 | -9,5 | -30,7 | 22,9 | -24,7 | 7,7 | 60,9 | 61,6 | 14,4 | 45,7 | -21,2 | 41,9 | -13,9 | 10,2 |
| 0113-668VAL* | 8,8 | 20,6 | 4,3 | 56,8 | -11,0 | 12,0 | -15,3 | -15,0 | 18,7 | 31,9 | -5,9 | 19,0 | 19,6 | NaN |
| 0113-660VAL* | 7,7 | -15,1 | 38,4 | -23,3 | 7,9 | 11,0 | 17,8 | -9,7 | -17,0 | -33,2 | 21,6 | 24,9 | 36,6 | -0,6 |
| 0113-634VAL* | -10,5 | -16,5 | -44,1 | 4,2 | -1,2 | -13,5 | -16,1 | -17,5 | 46,9 | -1,0 | -1,4 | -32,6 | 27,7 | -33,2 |
| 0113-656COR | -11,7 | -25,4 | 32,2 | -58,1 | -6,5 | -38,5 | -62,7 | -3,6 | -45,2 | -38,6 | -4,9 | -31,2 | -36,7 | 18,9 |
| 0113-671VAL | -12,4 | -13,8 | 7,2 | -34,3 | -40,4 | -12,0 | 15,7 | -13,7 | 9,1 | -2,8 | -35,7 | -17,1 | -9,5 | -0,2 |
| CRIOLLA | -13,2 | -36,8 | -31,6 | NA | -10,1 | -3,2 | NA | -23,3 | NA | -34,3 | 2,0 | -18,1 | -42,2 | -3,3 |

*Selected genotypes to be evaluated in semicomercial test

### Semicomercial test and variety registration

Selected genotypes, 0113-672COR and 0113-634VAL, were established in semicommercial test, their highest agronomic performance allowed the varietal registration as Corpoica Aurora and Corpoica Ambarina, respectively. genotypes 0113-668VAL and 0113-660VAL, are currently evaluated.

**Table 3.** Agronomic and quality trait in registered sweet potato varieties

| Trait | Check | Corpoica Aurora | Corpoica Ambarina |
|---|---|---|---|
| Total fresh root yield (Tn/ha) | 11,18+2,36b | 19,33+1,98a | 13,37+1,98ab |
| Commercial fresh root yield (Tn/ha) | 6,01+1,26a | 8,31+1,06a | 6,14+1,06a |
| Root Cracking | 2,18+1,19a | 3,97+0,96a | 1,39+0,38a |
| Ash content (%) | 3,34+0,14b | 4,66+0,17a | 4,76+0,19a |
| Total protein Content (%) | 7,09+0,41a | 8,01+0,39a | 8,38+0,49a |
| Crude Fiber (%) | 3,18+0,16b | 4,35+0,19ab | 4,51+0,57a |
| Dry matter content (%) | 47,55+0,42a | 30,73+0,92c | 37,8+1,83b |
| Total carotenes (ug/g) | 10,74+2,28b | 246,04+25,3a | 220,07+25,32a |
| Beta-Carotenes (ug/g) | 6,18+1,03b | 214,12+21a | 203,94+28,78a |

## Conclusions

Use of multilocal evaluations, individual and combined analysis through selection index allowed to identify genotypes with superior agronomic performance.

Corpoica Aurora produced more fresh root yield (19t/ha) compared to traditional clon (11.18t/ha). In terms of quality, Corpoica Aurora exhibited an increase of in ash (4.86%), protein (8.01%) and crude fibre (4.35%) compared to the traditional variety. Beta-carotene content (214ug/gr) was significantly higher compared to the check (6.18 ug/gr). Corpoica Ambarina exhibited excellent agronomic characteristics with major effect of environment in its yield and quality traits.

Considering the limited research in sweet potato crop in Colombia, these varieties offer excellent characteristics for farmers and markets.

## Bibliographic references

Glato K, Aidam A, Kane NA, Bassirou D, Couderc M, Zekraoui L, Vigouroux Y. 2017. PloS one, 12(5), e0177697.