



Ploidy: 3X Genome: AAB Subgroup: African Plantain Clone set: False Horn Type: Cooking Suspected country of origin: Ghana ITC code: ITC0223

Status

Apantu is a false horn plantain believed to originate from Ghana, rich in pro-Vitamin A carotenoids with at least $322 \mu g$ Retinol Activity Equivalent per 100g when raw (on fresh weight basis). This is estimated to meet 80% of the daily recommended intake of Vitamin A of children under 5 years.

It is being fast-tracked for potential adoption into the agri-food systems of Eastern Africa. It has been assessed on-station and on-farm in Burundi and Eastern Democratic Republic of Congo (DRC). On-station trials are also underway in Tanzania and Uganda.

Description

- It has medium-sized plant stature. The underlying pseudostem has a predominantly green-red colour (fig 3)
- * The leaf petiole is straight with erect margins that are winged and not clasping the pseudostem. It has pink coloured margins. The petiole base has sparse brown blotches (fig 4,5)
- * The leaves have an intermediate habit with both sides of the base pointed (fig 6)
- * The male bud is ovoid in shape with bracts that with an intermediate apex shape. The bracts have an inner pink-purple colour and an outer purple colour (fig 7)
- The flowers have a cream compound tepal tinted with pink and a yellow lobe. The free tepal is translucent cream with an oval shape. The style, filament and anthers are yellow (fig 8)
- The fingers are long, curved, and slender with pronounced ridges. The fruit apex is lengthily pointed with a persistent style as the remains of the flower relicts. The peel of mature unripe fruit is green in colour (fig 9)
 - The pulp colour of a mature finger (unripe) is yellow-orange: RHS 9/3 7507U (fig 10)



Fig 1. Apantu Bunch





Fig 3. Pseudostem





Fig 5. Petiole



Fig 6. Leaf

Fig 4. Neck



Fig 8. Male bud



Fig 7. Hand



Fig 9. Flower



*

Agronomic Traits (Average of 8-10 plants for 3 cycles)	Apantu
Time from flowering to harvest (days)	141.7
Plant height at flowering (cm)	275.0
Pseudostem girth at base at flowering (cm)	75.1
Number of functional leaves at flowering	8.6
Bunch weight (kg)	15.8
Number of hands	6.4
Number of fingers on bunch	59.7
Weight of hand (kg)	3.0
Fruit circumference (cm)	9.8
Fruit length (cm)	21.9



Fig 10. Finger

Agronomic Performance

APANTU | Bananas rich in Pro-Vitamin A Carotenoids

- Characteristics of Apantu to the left are based on agronomic data from onstation trials in Burundi, North and South Kivu in Eastern DRC
- Values are *averages* of 8-10 plants evaluated from over 3 cropping cycles in each site: Burundi-2 sites; South Kivu-3 sites; and North Kivu-3 sites
- Apantu takes approximately 4.7 months from flowering to maturity *
- A bunch of Apantu can weigh up to 25 kg

Pro-Vitamin A Carotenoid Content

- Apantu contains $4,680 \mu g/100g$ pro-Vitamin A carotenoids when raw and unripe (on fresh weight basis)
- This yields 322 µg to 687 µg Retinol Activity Equivalent per 100g when unripe and ripe which can be estimated to meet 80% to >100%of the daily recommended intake of Vitamin A of children under 5 years (400 RAE μ g/day) and 46% to 98% of the daily recommended intake of Vitamin A of adult women (700 RAE µg/day)

Values are means of three individual samples on fresh weight basis, per ripening stage of bunches obtained from North Kivu, DRC¹. 100g of banana is approximately one finger.

- The pro-Vitamin A carotenoid content increases as the banana ripens
- As a plantain (cooking type banana), Apantu can be boiled, fried, roasted or steamed with or without the peel. It can be cooked when unripe or ripe
- Apantu was preferred when roasted and fried in Burundi and Eastern DRC

References

- 1. Ekesa, B., Nabuuma, D., Kennedy, G., and Van den Bergh, I. 2017. Sensory evaluation of Provitamin A carotenoid-rich banana cultivars on trial for potential adoption in Bu-rundi and Eastern Democratic Republic of Congo. Fruits, vol72, No 5, pages 261-272
- 2. Ekesa, B., Nabuuma, D., Blomme, G. 2015. Provitamin A carotenoid content of unripe and ripe banana cultivars for potential adoption in eastern Africa. Journal of Food Composition and Analysis, Issue 43, pages 1-6.
- HarvestPlus carotenoid colour strips. 2007. Standardised using Royal Horticultural Society range of accepted colours and Universal Pantone colours. IPGRI-INIBAP/ CIRAD. 1996. Descriptors for banana (*Musa* spp.). International Plant Genetic Resources Institute, Rome Italy; International Network for the Improvement of Banana and Plantain, Montpellier, France; Centre de coopération internationale en recherché agronomique pour le développement, Montpellier, France. 4.

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Bioversity International





Ploidy: 3X Genome: AAB Subgroup: Pacific Plantain Clone set: Iholena Type: Cooking Suspected country of origin: Papua New Guinea ITC code: ITC0945

Status

Bira is a Pacific Plantain believed to originate from Papua New Guinea, and is rich in pro-Vitamin A carotenoids with at least 296 μ g Retinol Activity Equivalent per 100g when raw (on fresh weight basis). This is estimated to meet 74% of the daily recommended intake of Vitamin A of children under 5 years.

It is being fast-tracked for potential adoption into the agri-food systems of Eastern Africa. It has been assessed on-station and on-farm in Burundi and Eastern Democratic Republic of Congo (DRC). On-station trials are also underway in Tanzania, and Uganda.

Description

- Bira has a tall stature. The underlying pseudostem is light green in colour with pink-purple pigmentation (fig 3)
- * The leaf petiole is wide with erect margins that are winged, clasping the pseudostem. The petiole margin is green in colour. The petiole base has sparse brown blotches (fig 4,5)
- The leaves have an intermediate habit with both sides of the base rounded. The leaf upper surface is green while the under leaf is green yellow with a pink-red tinge (fig 6)
- The male bud is intermediate in shape with an obtuse and split bract apex shape. The bracts have an inner red colour and an outer purple-brown colour (fig 7)
- * The flowers have a pink compound tepal with a yellow lobe. The free tepal is tinted with pink and oval in shape. The style and filament are cream while anthers are yellow (fig 8)
- * The fingers are slightly curved and slightly ridged. The fruit apex is pointed with only the base of the style persisting as the floral relicts. The peel of mature unripe fruit is light green in colour and tends to yellow early as soon as the bunch is mature (fig 9)
 - The pulp colour of a mature finger (unripe) is yellow-orange: RHS 9/3 7507U (fig 10)



Fig 1. Bira Bunch





Fig 2. Whole plant

Fig 3. Pseudostem





Fig 5. Petiole



Fig 6. Leaf

Fig 4. Neck



Fig 7. Male bud



Fig 8. Flower



Fig 9. Hand



Agronomic Traits (Average of 8-10 plants for 3 cycles)	Bira
Time from flowering to harvest (days)	131.2
Plant height at flowering (cm)	307.8
Pseudostem girth at base at flowering (cm)	78.9
Number of functional leaves at flowering	9.5
Bunch weight (kg)	11.3
Number of hands	6.2
Number of fingers on bunch	63.1
Weight of hand (kg)	2.4
Fruit circumference (cm)	9.9
Fruit length (cm)	17.3



Fig 10. Finger

Agronomic Performance

- Characteristics of Bira to the left are based on agronomic data from onstation trials in Burundi, North and South Kivu in Eastern DRC
- Values are *averages* of 8-10 plants evaluated from over 3 cropping cycles in each site: Burundi– 2 sites; South Kivu– 3 sites; and North Kivu-3 sites
- * Bira takes approximately 4.4 months from flowering to maturity
- * A bunch of Bira can weigh up to 22 kg

Pro-vitamin A carotenoid Content

- Bira contains 4,339 µg/100g pro-Vitamin A carotenoids when raw and unripe (on fresh weight basis)
- * This yields 296 µg to 710 µg Retinol Activity Equivalent per 100g which can be estimated to meet 74% to >100% of the daily recommended intake of Vitamin A of children under 5 years (400 RAE µg/day) and 42% to 100% of the daily recommended intake of Vitamin A of adult women (700 RAE µg/day)

Values are means of three individual samples on fresh weight basis of bunches obtained from North Kivu, DRC¹. 100g of banana is approximately one finger.

- * As a plantain (cooking type banana), Bira can be boiled, fried, roasted or steamed with or without the peel. It can be cooked when unripe or ripe
- * The pro-Vitamin A carotenoid content increases as the banana ripens
- * Bira was preferred when fried and roasted in Burundi and Eastern DRC

References

- 1. Ekesa, B., Nabuuma, D., Kennedy, G., and Van den Bergh, I. 2017. Sensory evaluation of Provitamin A carotenoid-rich banana cultivars on trial for potential adoption in Burundi and Eastern Democratic Republic of Congo. Fruits, vol72, No 5, pages 261-272
- Ekesa, B., Nabuuma, D., Blomme, G. 2015. Provitamin A carotenoid content of unripe and ripe banana cultivars for potential adoption in eastern Africa. Journal of Food Composition and Analysis, Issue 43, pages 1-6.
- 3. HarvestPlus carotenoid colour strips. 2007. Standardised using Royal Horticultural Society range of accepted colours and Universal Pantone colours.
- IPGRI-INIBAP/ CIRAD. 1996. Descriptors for banana (*Musa* spp.). International Plant Genetic Resources Institute, Rome Italy; International Network for the Improvement of Banana and Plantain, Montpellier, France; Centre de coopération internationale en recherché agronomique pour le développement, Montpellier, France.

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Ploidy: 3X Genome: AAB Subgroup: Placific Pantain Clone set: Popo'ulu Type: Cooking Suspected country of origin: Hawaii ITC code: ITC1171

Status

Lahi is a Pacific plantain, believed to originate from Hawaii, rich in pro-Vitamin A carotenoids with at least 229 μ g Retinol Activity Equivalent per 100g when raw (on a fresh weight basis). This is estimated to meet 57% of the daily recommended intake of Vitamin A of children under 5 years.

It is being fast-tracked for potential adoption into the agri-food systems of Eastern Africa. It has been assessed on-station and on-farm in Burundi and Eastern Democratic Republic of Congo (DRC). On-station trials are also underway in Tanzania, and Uganda.

Description

- * Lahi has a tall stature. The underlying pseudostem has a predominantly green colour with a yellow tinge (fig 2)
- * The leaf petiole is straight with erect margins that are winged and clasping the pseudostem. The petiole base has small brown blotches (fig 4,5)
- The leaves have an intermediate habit and are bright green with both sides of the base rounded (fig 6)
- * The male bud is ovoid in shape with bracts that have an inner pink-purple colour and an outer purple-brown colour (fig 7)
- * The compound tepal, and free tepals on the flowers are yellow as are the style and filament (fig 8)
- * The fingers are cucumber shaped: short, straight, rounded and blunt. The fruit apex is also rounded without any flower relicts. The peel of mature unripe fruit is green in colour (fig 9)
- The pulp colour of a mature finger (with unripe) is light yellow: RHS 3/3 1205U (fig 10)



Fig 1. Lahi Bunch





Fig 2. Whole plant

Fig 3. Pseudostem





Fig 5. Petiole



Fig 6. Leaf



Fig 7. Male bud



Fig 8. Flower



Fig 9. Hand



Agronomic Traits (Average of 8-10 plants for 3 cycles)	Lahi
Time from flowering to harvest (days)	144.3
Plant height at flowering (cm)	301.4
Pseudostem girth at base at flowering (cm)	81.6
Number of functional leaves at flowering	10.1
Bunch weight (kg)	16.7
Number of hands	7.2
Number of fingers on bunch	83.0
Weight of hand (kg)	2.8
Fruit circumference (cm)	9.2
Fruit length (cm)	17.5



Fig 10. Finger

LAHI | Bananas rich in Pro-Vitamin A Carotenoids

Agronomic Performance

- Characteristics of Lahi to the left are based on agronomic data from onstation trials in Burundi, North and South Kivu in Eastern DRC
- Values are *averages* of 8-10 plants evaluated from over 3 cropping cycles in each site: Burundi- 2 sites; South Kivu- 3 sites; and North Kivu-3 sites
- Lahi takes approximately 4.8 months from flowering to maturity *
- A bunch of Lahi can weigh up to 30kg

Pro-vitamin A carotenoids Content

- Lahi contains $3,145\mu g/100g$ pro-Vitamin A carotenoids when raw and unripe (on fresh weight basis)
- This is estimated to yield 229 µg to 713 µg Retinol Activity *Equivalent* which could meet 57% to >100% of the daily recommended intake of Vitamin A of children under 5 years (400 RAE µg/day) and 33% to 100% of the daily recommended intake of Vitamin A of adult women $(700 \text{ RAE } \mu\text{g/day})$

Values are means of three individual samples on fresh weight basis of bunches obtained from North Kivu, DRC¹. 100g of banana is approximately one finger.

- The pro-Vitamin A carotenoid content increases as the banana ripens
- As a plantain (cooking type banana), Lahi can be boiled, fried, roasted or steamed with or without the peel. It can be cooked when unripe or ripe
- Lahi was preferred when roasted in Burundi and Eastern DRC with a mean score of 4, a rating of good using a 5 point hedonic scale

References

- Ekesa, B., Nabuuma, D., Kennedy, G., and Van den Bergh, I. 2017. Sensory evaluation of Provitamin A carotenoid-rich banana cultivars on trial for potential adoption in Bu-1. rundi and Eastern Democratic Republic of Congo. Fruits, vol72, No 5, pages 261-272
- Ekesa, B., Nabuuma, D., Blomme, G. 2015. Provitamin A carotenoid content of unripe and ripe banana cultivars for potential adoption in eastern Africa. Journal of Food Com-
- position and Analysis, Issue 43, pages 1-6. HarvestPlus carotenoid colour strips. 2007. Standardised using Royal Horticultural Society range of accepted colours and Universal Pantone colours. 3 4.
- IPGRI-INITERAP (IRRAD. 1996). Descriptors for banana (*Musa* spp.). International Plant Genetic Resources Institute, Rome Italy, International Network for the Improvement of Banana and Plantain, Montpellier, France; Centre de coopération internationale en recherché agronomique pour le développement, Montpellier, France.

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PELIPITA

Classification

Ploidy: 3X Genome: ABB Subgroup: Pelipita Clone set: Pisang Kuri Type: Cooking Suspected country of origin: Philippines ITC code: ITC0472

Status

Pelipita is a cooking banana believed to originate from the Philippines, rich in pro-Vitamin A carotenoids with at least 162 µg Retinol Activity Equivalent per 100g when raw (on fresh weight basis). This is estimated to meet 41% of the daily recommended intake of Vitamin A of children under 5 years.

It is being fast-tracked for potential adoption into the agri-food systems of Eastern Africa. It has been assessed on-station and on-farm in Burundi and Eastern Democratic Republic of Congo (DRC). On-station trials are also underway in Tanzania, and Uganda.

Description

- * Pelipita has a tall stature. The underlying pseudostem has a predominantly light green colour with purple pigmentation (fig 3)
- The leaf petiole is wide with erect margins that are winged and clasping the pseudostem. The petiole base has small brown blotches (fig 4,5)
- The leaves have an intermediate habit and are dark * green with both sides of the base rounded (fig 6)
- The male bud is lanceolate with bracts that have * an inner red colour and an outer purple colour. The bract apex is obtuse and split (fig 7)
- The flowers have pink compound and free tepals. * The style, filament and anthers are also pink (fig 8)
- The fingers are straight with pronounced ridges * and a pointed apex. The fruit apex has the base of the style prominent. The fruit peel is thick and does not peel easily. The peel of mature unripe fruit is green in colour (fig 9)
- The pulp colour of a mature finger (unripe) is light yellow: RHS 9/3 7505U (fig 10)



Fig 1. Pelipita Bunch





Fig 2. Whole plant

Fig 3. Pseudostem



Fig 4. Neck



Fig 5. Petiole



Fig 6. Leaf

Fig 7. Male bud



Fig 8. Flower



Fig 9. Hand



Agronomic Traits	Pelipita
(Average of 8-10 plants for 3 cycles)	
Time from flowering to harvest (days)	130.3
Plant height at flowering (cm)	332.8
Pseudostem girth at base at flowering (cm)	82.2
Number of functional leaves at flowering	10.3
Bunch weight (kg)	14.0
Number of hands	5.8
Number of fingers on bunch	57.5
Weight of hand (kg)	2.7
Fruit circumference (cm)	10.8
Fruit length (cm)	19.6



Fig 10. Finger

Agronomic Performance

PELIPITA | Bananas rich in Pro-Vitamin A Carotenoids

- Characteristics of Pelipita to the left are based on agronomic data from onstation trials in Burundi, North and South Kivu in Eastern DRC
- Values are *averages* of 8-10 plants evaluated from over 3 cropping cycles in each site: Burundi- 2 sites; South Kivu- 3 sites; and North Kivu-3 sites
- Pelipita takes approximately 4.3 months from flowering to maturity *
- A bunch of Pelipita can weigh up to 24 kg

Pro-vitamin A carotenoid Content

- Pelipita contains 1,734 µg/100g pro-Vitamin A carotenoids when raw and unripe (on fresh weight basis)
- This yields 133 µg to 162 µg Retinol Activity Equivalent per 100g of which can be estimated to meet 33% to 41% of the daily recommended intake of Vitamin A of children under 5 years (400 RAE µg/day) and 19% to 23% of the daily recommended intake of Vitamin A of adult women (700 RAE µg/day)

Values are means of three individual samples on fresh weight basis of bunches obtained from North Kivu, DRC¹. 100g of banana is approximately one finger.

- The pro-Vitamin A carotenoid content increases as the banana ripens *
- As a plantain (cooking type banana), Pelipita can be boiled, fried, roasted, or steamed with or without the peel. It can be cooked when unripe or ripe
- Pelipita was preferred when roasted in Burundi and Eastern DRC with a mean score of 4, a rating of good using a 5 point hedonic scale

References

- 1. Ekesa, B., Nabuuma, D., Kennedy, G., and Van den Bergh, I. 2017. Sensory evaluation of Provitamin A carotenoid-rich banana cultivars on trial for potential adoption in Burundi and Eastern Democratic Republic of Congo. Fruits, vol72, No 5, pages 261-272
- Ekesa, B., Nabuuma, D., Blomme, G. 2015. Provitamin A carotenoid content of unripe and ripe banana cultivars for potential adoption in eastern Africa. Journal of Food Composition and Analysis, Issue 43, pages 1-6. HarvestPlus carotenoid colour strips. 2007. Standardised using Royal Horticultural Society range of accepted colours and Universal Pantone colours.
- IPGRI-INIBAP/ CIRAD. 1996. Descriptors for banana (Musa spp.). International Plant Genetic Resources Institute, Rome Italy; International Network for the Improvement of Banana and Plantain, Montpellier, France; Centre de coopération internationale en recherché agronomique pour le développement, Montpellier, France.

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Ploidy: 3X Genome: AAA Subgroup: Red Type: Dessert Suspected country of origin: Thailand ITC code: ITC0403

Status

Lai is a dessert banana believed to originate from Thailand, rich in pro-Vitamin A carotenoids, with at least **48 µg Retinol Activity Equivalent** per 100g when raw (on fresh weight basis). This is estimated to meet **12% of the daily recommended intake** of Vitamin A of children under 5 years.

It is being fast-tracked for potential adoption into the agri-food systems of Eastern Africa. It has been assessed on-station and on-farm in Burundi and Eastern Democratic Republic of Congo (DRC). On-station trials are also underway in Tanzania, and Uganda.

Description

- * Lai has a tall stature. The underlying pseudostem has a predominantly re-purple colour (fig 3)
- The leaf petiole is open with spreading margins that are winged and undulating with pink coloured edges. The petiole base has large dark brown blotches (fig 4,5)
- * The leaves have an intermediate habit and are green with both sides of the base rounded (fig 6)
- * The male bud is ovoid in shape with an inner redpurple colour and an outer purple-brown colour. The apex of the bract is pointed (fig 7)
- * The flowers have a yellow compound tepal with a translucent cream free tepal. The style and filament are yellow in colour (fig 8)
- * The fingers are slightly curved and slightly ridged. The fruit apex is blunt tipped without any flower relicts. The peel of mature unripe fruit is light green in colour (fig 9)
- * The pulp colour of a mature finger (unripe) is dark yellow-orange: RHS 9/2 1355U (fig 10)



Fig 1. Lai Bunch





Fig 2. Whole plant

Fig 3. Pseudostem



Fig 4. Neck



Fig 5. Petiole



Fig 6. Leaf





Fig 8. Flower



Fig 9. Hand



Agronomic Traits (Average of 8-10 plants for 3 cycles)	Lai
Time from flowering to harvest (days)	137.5
Plant height at flowering (cm)	339.2
Pseudostem girth at base at flowering (cm)	88.2
Number of functional leaves at flowering	9.6
Bunch weight (kg)	13.5
Number of hands	5.4
Number of fingers on bunch	66.3
Weight of hand (kg)	2.2
Fruit circumference (cm)	10.6
Fruit length (cm)	17.2



Fig 10. Finger

Agronomic Performance

- Characteristics of Lai to the left are based on agronomic data from onstation trials in Burundi, North and South Kivu in Eastern DRC
- Values are averages of 8-10 plants evaluated from over 3 cropping cycles in each site: Burundi- 2 sites; South Kivu- 3 sites; and North Kivu-3 sites
- Lai takes approximately 4.6 months from flowering to maturity *
- A bunch of Lai can weigh up to 25kg *

Pro-vitamin A carotenoids Content

- Lai contains $746 \,\mu g/100g$ pro-Vitamin A carotenoids when *ripe* (on fresh weight basis)
- This yields **48 µg Retinol Activity Equivalent** per 100g which can be estimated to meet 12% of the daily recommended intake of Vitamin A of children under 5 years (400 RAE µg/day) and 7% of the daily recommended intake of Vitamin A of adult women (700 RAE µg/day)

Values are means of three individual samples on fresh weight basis of bunches obtained from North Kivu, DRC¹. 100g of banana is approximately one finger.

- The pro-Vitamin A carotenoid content increases as the banana ripens
- * Lai is a dessert banana that is mainly consumed when raw and fully ripe

References

- Ekesa, B., Nabuuma, D., Kennedy, G., and Van den Bergh, I. 2017. Sensory evaluation of Provitamin A carotenoid-rich banana cultivars on trial for potential adoption in Bu-1. rundi and Eastern Democratic Republic of Congo. Fruits, vol72, No 5, pages 261-272
- Ekesa, B., Nabuuma, D., Blomme, G. 2015. Provitamin A carotenoid content of unripe and ripe banana cultivars for potential adoption in eastern Africa. Journal of Food Composition and Analysis, Issue 43, pages 1-6. HarvestPlus carotenoid colour strips. 2007. Standardised using Royal Horticultural Society range of accepted colours and Universal Pantone colours.
- 3 IPGRI-INITERAP (IRRAD. 1996). Descriptors for banana (*Musa* spp.). International Plant Genetic Resources Institute, Rome Italy, International Network for the Improvement of Banana and Plantain, Montpellier, France; Centre de coopération internationale en recherché agronomique pour le développement, Montpellier, France. 4.

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Ploidy: 2X Genome: AA Type: Dessert Suspected country of origin: Papua New Guinea ITC code: ITC004

Status

To'o is a dessert banana believed to originate from Thailand, rich in pro-Vitamin A carotenoids with at least 544 μ g Retinol Activity Equivalent per 100g when raw (on fresh weight basis). This is estimated to meet >100% of the daily recommended intake of Vitamin A of children under 5 years.

It is being fast-tracked for potential adoption into the agri-food systems of Eastern Africa. It has been assessed on-station and on-farm in Burundi and Eastern Democratic Republic of Congo (DRC). On-station trials are also underway in Tanzania, and Uganda.

Description

- * To'o has medium-sized plant stature. The underlying pseudostem has a predominantly green-yellow colour with pink-purple pigmentation (fig 3)
- * The leaf petiole is open with spreading margins that are winged and not clasping the pseudostem. The petiole margin is pink-purple. The petiole base has sparse brown blotches (fig 4,5)
- * The leaves have an erect habit and are medium green with both sides of the base pointed (fig 6)
- * The male bud is intermediate in shape with an obtuse and split bract apex. The bracts have an inner orange red while the outer bract is red-purple in colour (fig 7)
- * The flowers have a cream coloured lobe and compound tepal. The free tepal is translucent white and fan shaped. The style and filament are cream in colour (fig 8)
- The fingers are long, curved, and slightly ridged. The fruit apex is lengthily pointed. The peel of mature unripe fruit is light green in colour (fig 9)
- The pulp colour of a mature finger (unripe) is yellow-orange: RHS : 9/3 7507 U (fig 10)



Fig 1. To'o Bunch





Fig 2. Whole plant

Fig 3. Pseudostem



Fig 4. Neck



Fig 5. Petiole



Fig 6. Leaf



Fig 7. Male bud





Fig 9. Hand



Fig 8. Flower

Agronomic Traits	Το'ο
Time from flowering to harvest (days)	111.9
Plant height at flowering (cm)	250.3
Pseudostem girth at base at flowering (cm)	65.0
Number of functional leaves at flowering	8.7
Bunch weight (kg)	4.3
Number of hands	4.2
Number of fingers on bunch	32.2
Weight of hand (kg)	0.8
Fruit circumference (cm)	9.1
Fruit length (cm)	18.8



Fig 10. Finger

Agronomic Performance

- Characteristics of To'o to the left are based on agronomic data from onstation trials in Burundi, and North and South Kivu in Eastern DRC.
- Values are averages of 8-10 plants evaluated from over 3 cropping cycles in each site: Burundi – 2 sites; South Kivu – 3 sites; & North Kivu - 3 sites.
- To'o takes approximately 3.7 months from flowering to maturity *
- A bunch of To'o can weigh up to 13 kg

Pro-vitamin A carotenoids Content

- To'o contains 7,765 µg/100g pro-Vitamin A carotenoids when ripe (on fresh weight basis)
- This yields 544 µg Retinol Activity Equivalent (RAE) per 100g which can be estimated to meet 136% of the daily recommended intake of Vitamin A of children under 5 years (400 RAE µg/day) and 777% of the daily recommended intake of Vitamin A of adult women (700 RAE μg/day)

Values are means of three individual samples on fresh weight basis of bunches obtained from North Kivu, DRC¹. 100g of banana is approximately one finger.

- The pro-Vitamin A carotenoid content increases as the banana ripens
- To'o is a dessert banana that is mainly consumed when raw and fully ripe

References

- 1. Ekesa, B., Nabuuma, D., Kennedy, G., and Van den Bergh, I. 2017. Sensory evaluation of Provitamin A carotenoid-rich banana cultivars on trial for potential adoption in Burundi and Eastern Democratic Republic of Congo. Fruits, vol72, No 5, pages 261-272
- Ekesa, B., Nabuuma, D., Blomme, G. 2015. Provitamin A carotenoid content of unripe and ripe banana cultivars for potential adoption in eastern Africa. Journal of Food Com-2
- 3.
- Banana and Plantain, Montpellier, France; Centre de coopération international en recherché agronomique pour le développement, Montpellier, France. 4.

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