

# THE CLASSIFICATION OF VARIETIES OF GROUNDNUT (*ARACHIS HYPOGAEA* L.)

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## SUMMARY

An expanded scheme of groundnut variety classification is presented which is revised in the light of recently collected West African material and is designed in concordance with the most recent taxonomic treatment of the species *Arachis hypogaea* L. This species consists of two subspecies ssp. *hypogaea* and ssp. *fastigiata* WALDRON. Each subspecies contains two botanical varieties. Those of ssp. *hypogaea* are var. *hypogaea* and var. *hirsuta* KOHLER and those of ssp. *fastigiata* WALDRON are var. *fastigiata* and var. *vulgaris* HARZ. Each infraspecific taxon contains a morphologically distinct group of cultivated varieties.

## INTRODUCTION

The purpose of this paper is to link the classification of the varieties of the cultivated groundnut presented by BUNTING (1955, 1958), and extended by SMARTT (1961) with the taxonomic treatment of KRAPOVICKAS and RIGONI (1960) and KRAPOVICKAS (1968); to incorporate some new African material into the classification, and to present a revised key to the varieties.

The groundnut (*Arachis hypogaea* L.) is a native of South America. It was probably brought to Africa from Brazil by the Portuguese early in the sixteenth century, when they established regular communication with the Indian subcontinent and with Ceylon and further Asia by way of the southern and eastern coasts of Africa. It was taken somewhat later from the west coast of South America to Asia (see HIGGINS 1951; MERRILL, 1954). At that time trade routes between the Persian Gulf, India and the East Coast of Africa had long been established by the Arabs (SAUER, 1952) and apparently by even earlier navigators. The cowpea, *Vigna sinensis* ENDL., may have been taken from Africa to Asia by this route (FARIS, 1965). Along all these routes stocks of groundnuts from widely-separated regions of the New World appear to have come together in Africa and to have given rise there to a new and distinct pattern of variation, different from that found in South America. The African continent can in fact be regarded as a secondary centre of variation of the groundnut. Some of the most widely grown varieties of the United States are believed to have come to North America from Africa; they are not found in South America except as introductions (KRAPOVICKAS, personal communication).

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*Morphological variation in A. hypogaea and its classification*

The groundnut is very variable morphologically and there are many recognizably distinct varieties. Variants of *A. hypogaea* have frequently been described as distinct species, subspecies and botanical varieties. The general taxonomic position was reviewed by GREGORY *et al.* (1951), who also proposed a classification of some of the varieties. It was based on an important distinction in branching pattern between two groups. (In the notation used by them, and in this paper, the main axis is denoted  $n$ , and first, second and higher order branches are  $n + 1$ ,  $n + 2$  etc). In their first group, Virginia, alternating pairs of vegetative and reproductive branches (inflorescences) are borne on the cotyledonary and other  $n + 1$  branches. The first two branches on an  $n + 1$  lateral are always vegetative and the main axis produces vegetative branches only. The alternating branching pattern is repeated in the higher orders of branching. In their second group, Spanish-Valencia, reproductive branches are borne in a continuous series on successive nodes on the cotyledonary and other  $n + 1$  branches, on which the first branch is always reproductive. Reproductive branches are also borne directly on the main axis at higher nodes. Most  $n + 2$  and all  $n + 3$  branches are reproductive. The Spanish and Valencia sub-groups differ in the pattern of production of  $n + 2$  vegetative branches. Spanish varieties produce such branches irregularly, but Valencias frequently have none; if any are produced they are formed in sequence distal to the 5–8th node of  $n + 1$  branches.

BUNTING (1955, 1958) accepted the main division of the species based on branching pattern and added a number of new variety groups to the classification. Additional material collected in Central Africa (SMARTT, 1961; MEIKLE, 1965) and West Africa by HARKNESS and GIBBONS (unpublished) has fitted into the revised scheme.

KRAPOVICKAS and RIGONI (1960) and KRAPOVICKAS (1968) have offered a taxonomic treatment of the main subdivisions of the species. The proposed divisions are as follows:

*Arachis hypogaea* L.

subspecies *hypogaea* (the Virginia group)

variety *hypogaea*

variety *hirsuta* KOHLER

subspecies *fastigiata* WALDRON

variety *fastigiata* (the Valencia type of GREGORY *et al.* and of BUNTING)

variety *vulgaris* Harz (the Spanish type of GREGORY *et al.* and the Spanish-Natal-Manyema groups of BUNTING)

KRAPOVICKAS and RIGONI also observed that in var. *vulgaris* the inflorescence is compound (branched) whereas in var. *fastigiata* it is simple (unbranched). The name *hirsuta* HARZ has been accepted by KRAPOVICKAS (1966, 1968) with varietal rank: it consists of a distinctive group of large (main axis up to a metre in length), hairy, late-maturing, prostrate forms, whose pods are coarsely marked, have a parrot-like beak, and contain 3–4 seeds. The sum of these characters distinguishes these from Virginia, Spanish or Valencia forms. They are native in Peru, but appear to have been taken from the west coast of America to Asia; they are, or could until very recently, still be found in India.

Neither GREGORY *et al.* (1951) nor KRAPOVICKAS and RIGONI (1960) or KRAPOVICKAS (1968) propose any further breakdown within the groups they define. They do,

however, mention characters which have been used subsequently by JOHN *et al.* (1954), BUNTING (1955, 1958) and TETENYI (1960) to establish smaller subgroups. Similar schemes have also been proposed by KUMAZAWA and NISHIMURA (1952) and MAZZANI and COBO (1957). TARDIEU (1954), JACQUOT (1962) and MAEDA (1964) have investigated floral characters and correlated these with varietal differences. However, the vegetative and fruit characters appear to be more useful than floral characters in the classification of groundnut varieties. BUNTING (1955) and MAZZANI and COBO (1957) follow GREGORY *et al.* (1951) in accepting branching pattern as the basis of their classifications, but JOHN *et al.* (1954) and TETENYI (1960) do not. Experiences with large collections at several centres in Africa and America during the last 15 years has fully confirmed the significance of branching pattern and its taxonomic (as well as agronomic) importance.

The following systematic scheme has been devised by combining the systems of GREGORY *et al.* (1951) and BUNTING (1955, 1958) with the taxonomic treatment of KRAPOVICKAS and RIGONI (1960).

The primary division of the species separates the subspecies *hypogaea* (alternately-branched) and *fastigiata* (sequentially-branched). The subspecies *hypogaea* includes the distinct variety *hirsuta* and the variety *hypogaea*, which is then divided into variety groups according to pod characters, seed numbers and general appearance, and subsequently into variety clusters based on habit (bunch and runner). Within these variety clusters testa colour distinguishes individual varieties.

The subspecies *fastigiata* (all upright forms) includes the varieties *fastigiata* (the very distinct 'Valencia' forms) and *vulgaris* (the Spanish-Natal-Manyema complex), separated on habit and characters of the inflorescence. These varieties are further divided, according to pod and seed characters, into variety groups and clusters. Finally, as in the subspecies *hypogaea*, the individual varieties may be distinguished according to testa colour.

#### *Systematic arrangement of sub-specific taxa, variety groups and clusters*

Species: *Arachis hypogaea* L.

I. *Subspecies hypogaea*. Habit prostrate or erect, branching alternate; inflorescences simple and never borne directly on main axis; first branch on cotyledonary axis always vegetative; 2 or 2-3-4 seeds per pod; pod beak pronounced, small or absent; pod constrictions pronounced, moderate or absent; pod diameter very large 20 mm + to small 10 mm or less; testa colour commonly brown but red, white and purple forms are recorded; seed dormancy usually present; foliage dark green in colour.

##### (i) var. *hypogaea*

Habit prostrate or erect, main axis in prostrate forms short not usually exceeding 400-500 mm in length; stems not usually very hairy; medium-late maturing.

1. Cultivar group. Virginia: bunch and runner forms; pods all 2-seeded, beaks present but small, pods moderately or slightly constricted, very large to small; testa colour brown but red, white and purple forms occur, testas not variegated.

CLASSIFICATION OF GROUNDNUT VARIETIES

Cultivar clusters

- A. Bunch habit
  - a. Virginia Bunch pod large 15–20 mm diameter
  - b. Fung Bunch pod medium 10–15 mm diameter
  - c. Castle Cary pod small 10 mm diameter or less
- B. Runner habit
  - a. Jumbo Runner pod very large and coarse 20 mm + in diameter
  - b. Virginia Runner pod as Virginia Bunch
  - c. Kongwa Runner pod as Fung Bunch
  - d. Indian Runner pod as Castle Cary
- 2. Cultivar group Matevere: as Virginia but 2–3–4 seeded (usually 3-seeded)

Cultivar clusters

- A. Bunch habit
  - a. Matevere Bunch pods as Fung Bunch in diameter
  - b. Slim Matevere Bunch pods as Castle Cary in diameter
- B. Runner habit
  - a. Mayoba pods as Jumbo Runner in diameter
  - b. Large Chimbuwila pods as Virginia Bunch in diameter
  - c. Chimbuwila pods as Fung Bunch in diameter

No forms of Matevere Bunch with large pods or runners with small 3-seeded pods are known at present.

- 3. Cultivar group Georgia: as Virginia but with beakless pods.

Cultivar clusters

- A. Bunch habit – constricted pods
  - a. Georgia Bunch pods medium 10–15 mm diameter
  - b. Ilorin Bunch pods small less than 10 mm in diameter
    - unstricted pods
    - a. Samaru Bunch pods small less than 10 mm in diameter
- B. Runner habit – constricted pods
  - a. Zaria Runner pods as Ilorin Bunch
    - unstricted pods
    - a. Natal Runner Pods as Samaru Bunch

No large podded forms have been found in this group.

- 4. Cultivar group Nambyquarae: as Virginia but with large beaks on pods and variegated testas.

Cultivar clusters

- A. Bunch habit
  - a. Pintado pods medium 10–15 mm diameter
- B. Runner habit
  - a. Nambyquarae pods very large 20 mm diameter
  - b. Rasteiro pods medium 10–15 mm diameter

This group has only recently been introduced to cultivation in Africa.

(ii) var. *hirsuta* KOHLER

Habit prostrate, main axis may exceed 1 m in length; stems fairly hairy, very late maturing; pods strongly beaked, 2–3–4 seeded.

The range of morphological variation within this botanical variety is not well documented and it less widely distributed than formerly, because it is extremely susceptible to *Cercospora* leafspots.

II. *Subspecies fastigiata* WALDRON. Habit erect, branching sequential; inflorescences (simple or compound) always present on main axis; first branches on cotyledonary laterals reproductive; testa colours light tan (brown) red, white and purple – all non variegated; seed-dormancy absent; foliage lighter in colour than in subsp. *hypogaea*.

(i) var. *fastigiata*

Inflorescences simple; vegetative branches on  $n + 1$  branches absent or occurring in sequences distal to 5–8 node; pods 2 or 2–3–4 seeded, beaks present or absent, constrictions present or absent, size medium to small; brown, red, white and purple testa colours occur.

1. Cultivar group Valencia: typically only four branches on main stem; pods 2–3–4 seeded, beaks absent, not or very little constricted, size medium or small; testa colours commonly red but brown, white and purple forms are recorded.

Cultivar clusters

- |                   |                                 |
|-------------------|---------------------------------|
| a. Valencia       | pods medium diameter (10–15 mm) |
| b. Short Valencia | pods stubby 2–3 seeded          |

(ii) var. *vulgaris* HARZ

Inflorescences compound; vegetative branches occasionally found, irregularly located on  $n + 1$  order branches; pods 2-seeded, beak absent, constrictions absent or present, size medium or small; testa colour commonly brown but red, white and purple forms occur.

1. Cultivar group Spanish: strictly 2-seeded (3-seeded pods rare), pods constricted.

Cultivar clusters

- |                  |  |
|------------------|--|
| a. Large Spanish | pods medium 10–15 mm diameter<br>(cf. Georgia Bunch) |
| b. Spanish       | pods small 10 mm diameter (cf. Ilorin Bunch)         |

2. Cultivar group Natal: strictly 2-seeded, pods unconstricted.

Cultivar clusters

- |                |                               |
|----------------|-------------------------------|
| a. Large Natal | pods medium 10–15 mm diameter |
| b. Natal       | pods small 10 mm diameter     |

3. Cultivar group Manyema: pods 2 or 2–3–4 seeded beaks and constrictions marked, medium or small in size; testa colours brown, red, purple and white are recorded.

Cultivar clusters

- |                 |   |
|-----------------|---|
| a. Long Manyema | 2–3–4 seeded pods – medium diameter<br>(10–15 mm) |
| b. Manyema      | 2 seeded pods – medium diameter (10–15<br>mm)     |

Some forms which are known to have resulted from experimental hybridization

CLASSIFICATION OF GROUNDNUT VARIETIES

have been excluded from this scheme. For example some very large podded forms of Manyema conformation have been produced by crossing Natal Common and Nambyquarae types in South Africa (SELLSCHOP personal communication).

Bunting (1958) pointed out the apparently homologous pattern of variation in the two subspecies of *A. hypogaea*. The parallels between the Spanish and Georgia groups are especially close. A similar parallel was suggested between Virginia and Manyema, but the greater beak development in the Nambyquarae group and also in var. *hirsuta* suggests that these resemble Manyema more closely than Virginia does. Alternately branched homologues of the Valencia group have not been reported from Africa but some alternately branched Peruvian Runner types lack the typical beak and have a Valencia type pod.

This scheme of classification is based on material available in Africa. Much South American material collected by KRAPOVICKAS and GREGORY can be assigned readily to the groups defined here, but some of it cannot. It is to be expected that further study may well expand the existing scheme still further.

NEW FIELD KEY TO THE CULTIVATED GROUNDNUTS

All groups are typically 2-seeded unless otherwise stated.

- |   |                       |
|---|-----------------------|
| 1. Branching alternate  | 2                     |
| Branching sequential  | 16                    |
| 2. Habit prostrate (runner forms)                               | 3                     |
| Habit upright (spreading bunch forms)                           | 9                     |
| 3. Kernels variegated   | Nambyquarae (Runner)  |
| Kernels not variegated (various colours, commonly russet brown) | 4                     |
| 4. Pods typically constricted                                   | 5                     |
| Pods not constricted – small                                    | Natal Runner          |
| 5. Pod with well defined beak                                   | 6                     |
| Pod without beak – small  | Zaria Runner          |
| 6. Pods 2-seeded  | 7                     |
| Pods 2–3–4 seeded   | 8                     |
| 7. Pods small   | Indian Runner         |
| Pods medium   | Kongwa Runner         |
| Pods large  | Virginia Runner       |
| Pods very large, coarsely marked                                | Jumbo Runner          |
| 8. Pods medium  | Chimbuwila            |
| Pods large  | Large Chimbuwila      |
| Pods very large, coarsely marked                                | Mayoba                |
| 9. Kernels variegated   | Nambyquarae (Upright) |
| Kernels not variegated  | 10                    |
| 10. Pods typically constricted                                  | 11                    |
| Pods typically not constricted, pods small                      | Samaru Bunch          |
| 11. Pods typically beaked                                       | 12                    |
| Pods typically not beaked                                       | 15                    |
| 12. Pods 2-seeded   | 13                    |
| Pods 2–3–4 (typically 3) seeded                                 | 14                    |

13. Pods small	Castle Cary
Pods medium	Fung Bunch
Pods large	Virginia Bunch
14. Pods small	Slim Matevere
Pods medium	Matevere
15. Pods small	Ilorin Bunch
Pods medium	Georgia Bunch
16. Pods typically constricted and beaked often keeled	17
Pods not as above	18
17. Pods medium – 2 seeded	Manyema
Pods medium – 2–3–4 seeded	Long Manyema
18. Pods constricted but not beaked nor keeled	19
Pods not constricted, not beaked nor keeled	20
Pods typically indented only, shell thick and spongy, typically 3–4 seeded with kernels adpressed	21
19. Pods small	Spanish
Pods medium	Large Spanish
20. Pods small	Natal
Pods medium	Large Natal
21. Pods small – typically 3 seeded	Short Valencia
Pods medium – typically 3–4 seeded	Valencia

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CLASSIFICATION OF GROUNDNUT VARIETIES

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