
 ECPGR Umbellifer WG wild relatives project.

Action report

Taxonomical characterization of carrot wild relatives

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1. Project background

As part of the Umbellifer Crops WG's workplan, a project on umbellifer wild relatives was decided, as they are precious genetic resources, but may present some problems such as being endangered *in situ*, taxonomic misidentification of *ex situ* accessions, or lack of characterization and knowledge. The present action addresses the problem of misidentification or lack of identification on the taxonomic point of view of carrot wild relatives' accessions.

The aim of this action was to collect, grow, characterize and identify taxonomically a set of carrot wild relatives' accessions from several genebanks or collections in Europe.

2. Taxonomic organisation in *Daucus*

Tab 1. Adopted classification based on Small (1978) and Reduron (2007)

| Species | Sub-group | subsp | var | |
|-------------------------|------------------------------------|---|---------------------------|--|
| Daucus carota L. | carota | carota | carota mauritanicus | |
| | | gadeceai | | |
| | | maritimus | | |
| | | maximus | | |
| | | | sativus | sativus atrorubens |
| | gummifer | commutatus | commutatus tenuisectus | |
| | | drepanensis | | |
| | | | gummifer | gummifer (=ssp hispidus) fontanesii |
| | | | hispanicus | Brachycaulos Hispanicus linearis |
| | Other <i>Daucus</i> species | <i>Daucus crinitus</i> Desf. ; <i>Daucus glochidiatus</i> (Labill.) ; <i>Daucus gracilis</i> Steinh ; <i>Daucus guttatus</i> Sm ; <i>Daucus littoralis</i> Sm ; <i>Daucus montevidensis</i> Link <i>Daucus muricatus</i> L. ; <i>Daucus sahariensis</i> Murb. ; <i>Daucus bicolor</i> (=D. Broteri)... | | |

3. Material and methods

3.1 Accessions

The accessions to be identified were provided mainly by Wellesbourne Genebank (HRIGRU, UK), Agrocampus Ouest (ACO-IRHS, FRA), IPK Gatersleben (IPK, GER). Other accessions from University of Krakow (POL) and JKI (GER) were also identified for research purposes (not presented).

Tab 2. Number of accessions characterized in 2012-2013

| | Source | Existing identification | No identification | Control | Total |
|-------|---------------------------|-------------------------|-------------------|---------|------------|
| 2012 | HRIGRU IPK ACO-IRHS | 10 3 5 | 10 9 | 10 | 47 |
| 2013 | HRIGRU ACO-IRHS | 13 10 | 37 | 8 | 68 |
| total | | 41 | 56 | 18 | 115 |

3.2 Characterization

Two series were studied in 2011-2012 and 2012-2013.

The seeds were planted in trays in greenhouse in September. The accessions were characterized first at the rosette stage (Fig 1A).

After sufficient development, the plants were vernalized in cold greenhouse, in order to be able to observe the blooming stage and avoid variations due to annual/biannual habits.

In March-April the following year, 8 plants per accession were transplanted in the field under irrigated conditions. The plants were observed and characterized in mid-July, at the blooming stage (Fig 1B).

General habit, basal leaves, stem type, umbel, bracts, and fruits (when present) were observed.

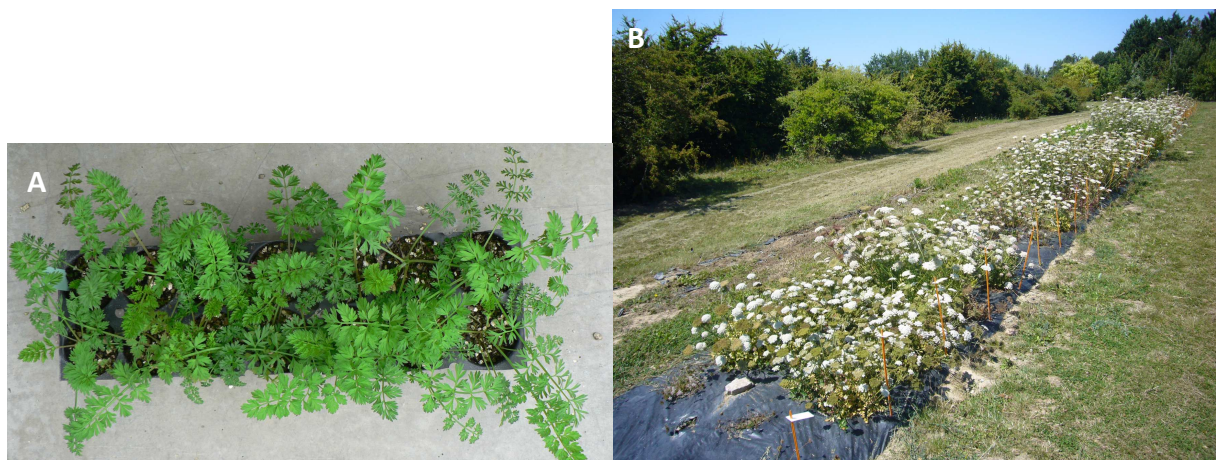


Fig 1. Observation of accessions at the rosette stage (A) and the blooming stage (B).

4. Results

As expected, the observations showed an important variation in wild carrot. Most of accessions were quite homogenous and some were uneasy to identify as they were intermediate or a mix between taxa. The identification was based on the observations and comparison with control accessions well identified. (Fig 2).

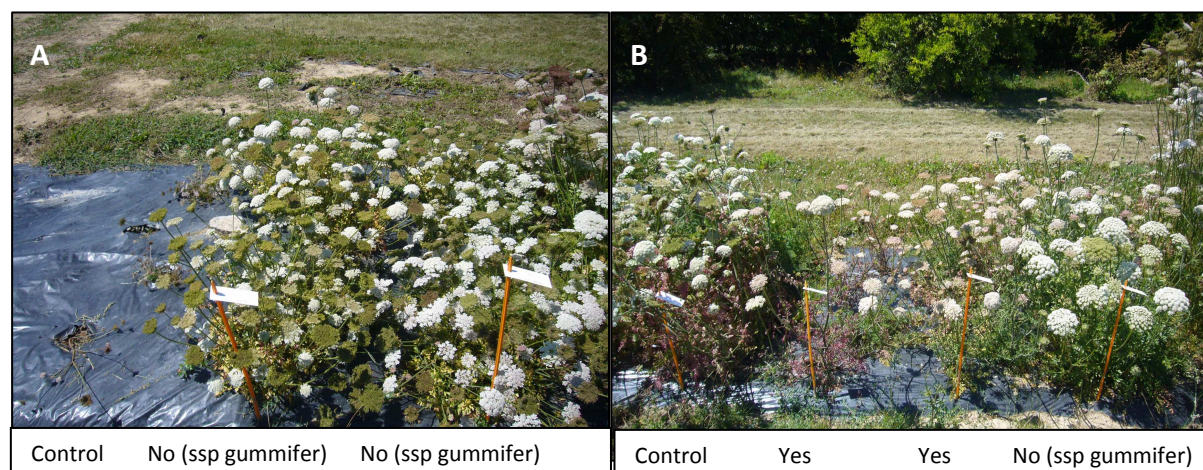


Fig 2. Comparison of accessions with control for ssp *gadeceai* (A) and ssp *commutatus* (B).

We report here the synthesis of the taxonomical identification. The detailed results are presented in annex.

Tab 3. Identification results for the 2012 batch

| ID Accession | Nb Acc. | ID Correct | ID Not correct | Proposed new ID when not correct or absent |
|--|---------|------------|----------------|---|
| <i>D.c. ssp gadeceai</i> | 2 | | 2 | <i>gummifer; gummiferXgadeceai</i> |
| <i>D.c. ssp maritimus</i> | 1 | | 1 | <i>Cultivated or wildXCultivated</i> |
| <i>D.c. major</i> | 1 | | 1 | <i>var carota</i> |
| <i>D.c. maximus</i> | 3 | | 3 | <i>var carota (2); gummifer (1)</i> |
| <i>D.c. maxima</i> | 1 | | 1 | <i>var carota</i> |
| <i>D.c. ssp gummifer</i> | 3 | 2 | 1 | <i>carotaXgummifer</i> |
| <i>Ssp gummifer var fontanesii</i> | 3 | 3 | | |
| <i>D.c. ssp commutatus</i> | 3 | 2 | 1 | <i>gummifer var fontanesii?</i> |
| <i>D.c. ssp gingidium</i> | 1 | | 1 | <i>gummifer</i> |
| <i>D. azoricus Franco</i> | 1 | | 1 | <i>Ssp gummifer</i> |
| <i>Binyomina 1 wild/sativus?</i> | 1 | - | - | <i>Ssp sativus</i> |
| <i>Daucus sp</i> | 2 | - | - | <i>var mauritanicus (2)</i> |
| <i>D.c.</i> | 7 | - | - | <i>var carota (6); ssp gummifer (1)</i> |
| <i>D. carota (no ssp)</i> | 2 | - | - | <i>var carota (2)</i> |
| <i>D.c. L subsp?</i> | 9 | - | - | <i>Subgroup gummifer(6), intermediate ssp carota X ssp gummifer (3)</i> |
| <i>D. montevidensis</i> | 1 | 1 | - | <i>D. pusillus (synonym)</i> |
| <i>D. guttatus, D.c. libanotifolia, D.c. hispidifolius</i> | 3 | - | - | To be checked again |
| total | 44 | 8 | 12 | Missing ID : 21 |

Tab 4. Identification results for the 2013 batch

| ID Accession | Nb Acc. | ID Correct | ID Not correct | Proposed new ID when not correct or absent |
|-----------------------------|------------|---------------|----------------------|---|
| <i>D.c. ssp drepanensis</i> | 1 | | 1 | <i>Ssp carota var carota</i> |
| <i>D.c. ssp commutatus</i> | 2 | 2 | | <i>Ssp commutatus var tenuisectus</i> |
| <i>D.c. ssp gummifer</i> | 4 | 2 | 2 | <i>Ssp gummifer var fontanesii (1), intermediate ssp carota X ssp gummifer (1)</i> |
| <i>D.c. ssp gingidium</i> | 1 | | 1 | <i>Ssp commutatus</i> |
| <i>Ssp carota</i> | 7 | 5 | 2 | <i>Intermediate gummifer X ssp carota (1), ssp gumifer var fontanesii (1)</i> |
| <i>D.c. ssp maritimus</i> | 2 | 1 | 1 | <i>Ssp gummifer var gummifer</i> |
| <i>D. carota (no ssp)</i> | 32 | - | - | <i>Ssp carota var carota (16) Xsp carota (1) Ssp commutatus (1) Ssp gummifer var fontanesii (3) Intermediate ssp carota X ssp gadeceai (1) Intermediate ssp gummifer X carota (1) Ssp sativus (5) cultivated Hybrid cultivated X wild (2) ssp sativus cultivated or hybrid (2) Non identified (5)</i> |
| <i>D. duriens</i> Lange | 1 | 1 | | |
| <i>D. littoralis</i> | 1 | 1 | | |
| total | 51 | 12 | 7 | Missing ID : 32 |

The main confusions were within *Daucus carota* L. Most of accessions were correctly separated between ssp carota and ssp gummifer, but with confusion at the variety level. About 50 accessions without identification were identified. Despite their classification as wild type, 6 accessions were indeed of the cultivated type, while 5 corresponded to hybrids between the cultivated and wild types. However, different types of classifications can lead to various identifications between genebanks. Traceability of identifications in database is an important challenge.

5. Conclusion

There is a high phenotypic variation in the genera *Daucus*, and within *Daucus carota* L. This variation along with the environmental plasticity makes the taxonomical identification difficult. Observations in similar agronomic conditions and comparison with reference accessions facilitate such identification. Plant and organ precise measurements and genotyping would be informative in this regard.

A mutualised effort is still needed to reduce the rate of lacking identification or misidentification, in order to allow the valorisation of these important resources for the species knowledge and improvement.

Litterature

- Reduron, J.P.** (2007). Ombellifères de France - Tome II, *Société botanique du Centre-Ouest*. 345p.
- Small, E.** (1978). A numerical taxonomic analysis of the *Daucus carota* complex. *Canadian Journal of Botany* **56**: 248-276

Appendix - Characterization and identification results

2013 batch

| Source | ID | SP | Taxon | Proposed new identification | Homogeneity | Observations |
|--------|------|-----------|--------------|---------------------------------|---------------------|--|
| HRIGRU | 6668 | D. carota | drepanensis? | ssp carota var carota | Homogenous | halophylus type, umbel in nest, |
| HRIGRU | 7999 | D. carota | commutatus | ssp commutatus var tenuisectus | average homogeneity | Typical foliage but finely cut (=tenuisectus) |
| HRIGRU | 7386 | D. carota | commutatus? | ssp commutatus var tenuisectus | homogenous | Foliage finely cut (=tenuisectus) |
| HRIGRU | 7387 | D. carota | gummifer | ssp gummifer var gummifer | average homogeneity | Glossy foliage fleshy, + / - cut. Bracts narrow, lanceolate, linear. Fruiting umbel flat . Port stocky, hairy plant. Fruit spines up (= gummifer). 1 flowering plant |
| HRIGRU | 8706 | D. carota | gummifer? | ssp gummifer var fontanesii | homogenous | Habit gummifer, stocky, hairy stem. Broadleaf fleshy matt. Bracts narrow, radiating spines + / - welded. |
| HRIGRU | 8710 | D. carota | gummifer? | intermediaire carota x gummifer | homogenous | Habit carota except one plant. Divided foliage, slightly clear. Leaves slightly fleshy and broad base (= intermediate). Stems hairy. Bracts narrow somewhat fleshy. Umbel beaming, rather nest. Spines radiating rights not confluent. |
| HRIGRU | 8713 | D. carota | gummifer? | ssp gummifer | average homogeneity | Slightly glossy leaves, broad, fleshy. Hairy stems, zig-zag. Bracts lanceolate + / - elongated. Umbels radiant rigid rays, but no fruit. |
| HRIGRU | 8728 | D. carota | gingidium? | ssp commutatus | homogenous | Rosette habit commutatus. Leaves fleshy, glossy, cut as commutatus. Fruiting umbel leathery very hard. Short spines facing up. |

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|--------|------|-----------|-----------|---|-----------------|--|
| HRIGRU | 7996 | D. carota | maritimus | ssp gummifer var gummifer | very homogenous | Robust vigorous upright plant (thick stem glabrous). Bracts lanceolate + / - elongated. Fairly rigid rays .. Broad foliage, almost dull. |
| HRIGRU | 7385 | D. carota | carota | ssp carota var carota | homogenous | Habit carota high, slender, leafy little. Base cut sheets, medium width, matte, just fleshy. Soft rays. Bracts linear flexible. Radiating spines, thin, straight, free. Radiant flowers. |
| HRIGRU | 7876 | D. carota | carota | intermediaire ssp gummifer x ssp carota | homogenous | Habit gummifer stocky. Side rods ascending. Base leaves much cut, glossy, lanceolate lobes, non-fleshy. Bracts FL1 thickish, lanceolate, + / - elongated. Bracts FL2 elongated flexible. Rays + / - rigid. Radiant flowers. Fruiting umbels FL1 closed in nest. Many spines, long, straight, free. |
| HRIGRU | 6674 | D. carota | | intermediaire ssp carota x ssp gadeceai | homogenous | Vigor problem: only 2 plants, foliage disappeared except base. Hybrid habit carota x gadeceai. Highly branched plants. Leaves lanceolate lobes basis, rather fleshy. Small umbel. Bracts flexible linear. Soft rays. Fruiting umbel nest. Spines numerous, rights, free, long, radiant. |
| HRIGRU | 6678 | D. carota | | ssp carota var carota | very homogenous | Habit carota. Port slender but sturdy. Basal leaves cut + / - lanceolate, dull, not fleshy. Bracts linear flexible. Soft rays. Flowers radiating medium. Fruiting umbel nest. Spines medium length, radiant, free, straight. |
| HRIGRU | 6679 | D. carota | | ssp carota var carota | homogenous | Habit carota but slender maritimus trend. Cut basal leaves lanceolate, slightly fleshy, dull. Soft rays. Bracts narrow flexible linear. Flowers slightly radiating. Spines average number, average length, straight, radiant, free. Umbel nest. |
| HRIGRU | 6680 | D. carota | | ssp carota var carota | homogenous | Habit carota slender. Basal leaves slightly fleshy, dull, cut, lanceolate. Soft rays. Central yellow flower! Bracts linear flexible. Fruiting umbel in nest. Long spines radiating straight free. |
| HRIGRU | 7192 | D. carota | | intermediate ssp gummifer x ssp carota? | heterogenous | Hairy stem hispid. Basal leaves shiny to dull, cut into very lobed leaf oak type lanceolate segments. Soft rays. Bracts lanceolate to linear. Radiant flowers. no green fruit |
| HRIGRU | 7194 | D. carota | | ssp carota var sativus | | Dead plants. Early bolting at plantlet stage. Cultivated type , pink tuberous root at plantlet stage. |

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|--------|------|-----------|--|--|---------------------|--|
| HRIGRU | 8777 | D. carota | | ssp carota var carota | average homogeneity | habit carota. Basal leaves not fleshy, dull to somewhat shiny, lanceolate lobes. Soft rays. Bracts linear flexible. Flowers radiating medium. Fruiting umbel in nest. Spines radiating straight free |
| HRIGRU | 8692 | D. carota | | ssp gummifer var fontanesii | homogenous | Habit gummifer stocky, rigid branched rays. Bracts linear flexible wide. Umbel FL1 flat at the top, FL2 in cup. Prickles rights medium length, rather stocky, radiant, slightly fused at base. Homogeneous except plant height. |
| HRIGRU | 8708 | D. carota | | ssp gummifer var fontanesii | average homogeneity | Habit gummifer, robust, stocky, branched. Broad foliage, fleshy, slightly glossy. Rigid rays. FL1 fleshy bracts, + / - long and lanceolate. Bracts FL2 linear and flexible. Umbel dome. Flowers radiating significantly. Fruiting umbel flat and compact or nest. Spines straight, medium length, rather stocky, radiant, free. Homogeneous except size. |
| HRIGRU | 8711 | D. carota | | ssp gummifer var fontanesii / var gummifer | homogenous | Habit gummifer, robust, stocky, spreading branches. Broad-leaved (oval), fleshy, glossy. Rigid rays. Bracts fleshy, ovate to + / - lanceolate. Umbel dome. Flowers a little radiant. FL1 and FL2 fruiting umbel flat or cut. Spines short, stocky, straight, free. Homogeneous except size. |
| HRIGRU | 8729 | D. carota | | ssp commutatus | | Commutatus foliage type. Rosette stage, foliage only. |
| HRIGRU | 9190 | D. carota | | ssp carota var carota | | Habit carota slender. Not fleshy foliage, matte, cut, lanceolate. Soft rays. Bracts linear flexible. Flowers radiating medium. Fruiting umbel nest. spines radiating. |
| HRIGRU | 9198 | D. carota | | ssp carota var carota | very homogenous | Habit carota slender, little leaves, shape of maritimus ssp. Basal leaves somewhat fleshy, dull, cut, lanceolate. Upper leaves divided into linear segments. Soft rays. Bracts linear flexible. Weakly radiating flowers. Fruiting umbel nest. Spines not developed. |
| HRIGRU | 9246 | D. carota | | ssp carota var carota | heterogenous height | Port carota vigorous, robust. Stem hispid. Basal leaves somewhat fleshy, dull, cut, lanceolate, obales lobes. Bracts linear flexible. Soft rays. . Flowers radiating medium. Fruiting umbel nest. Many straight spines. Good homogeneity except for size. 2 dead plants (health pb?). |

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|--------|-----------|-----------|--|------------------------|---------------------|---|
| HRIGRU | 9257 | D. carota | | ssp carota var carota | heterogenous height | Habit carota, vigorous. Basal leaves somewhat fleshy, dull, very divided, lanceolate. Bracts linear flexible. Flexible somewhat rigid rays. Flowers slightly radiating to radiating significantly. Floral stage, no green fruit. Good homogeneity except for size. Some poorly developed plants (bp health?). |
| HRIGRU | 9258 | D. carota | | ssp carota var carota | | Unrated, sickly stunted plants (health pb?). |
| HRIGRU | 9259 | D. carota | | ssp carota var carota | very homogenous | Port carota strong. Basal leaves not fleshy, dull, very divided, lanceolate. Bracts narrowly linear flexible. Soft rays. Flowers radiating significantly. 2 plants at floral stage, no fruit. |
| HRIGRU | 9265 | D. carota | | ssp carota var carota | homogenous | Habit carota, average vigor. Basal leaves not fleshy, dull, very divided, lanceolate. Bracts linear flexible. Soft rays. Radiant flowers. Spines straight, radiant, free. |
| HRIGRU | 9276 | D. carota | | ssp carota var carota | | Plants not well developed. Basal leaves not fleshy, dull, divided, lanceolate. Bracts linear flexible. Soft rays. Radiant flowers. No young fruit. |
| HRIGRU | 9280 | D. carota | | ssp carota var carota | | Only one correct plant, bud stage. |
| HRIGRU | 9287 | D. carota | | ssp carota var carota | | Unrated. Plants not properly developed. |
| HRIGRU | 9293 | D. carota | | ssp carota var sativus | | Cultivated type. Yellow root. |
| HRIGRU | 1040 7 | D. carota | | ?? | | Wild or hybrid wild X cultivated? Less vigorous plants, early, fruit stage. Bracts linear elongated terminal segments. Umbel nest. Rigid rays. Spines straight, few, medium length, free. |
| HRIGRU | 1041 0 | D. carota | | ssp carota var sativus | | The cultivated type. Violet roots and anthocyanin plant. Umbel FL1 flat, appearance ball. |
| HRIGRU | 1048 6 | D. carota | | ssp carota var sativus | | Cultivated type, violet roots. Plants not well developed except one. Umbel very curved, floral stage without central flower. |

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|--------|-----------|-----------|--|--|--------------|--|
| HRIGRU | 1049 1 | D. carota | | hybride sauvage X cultivé? | | Seedling stage: tuberous roots slightly white to purple. Robust plants. Bracts linear flexible. Soft rays. Umbel FL1 closed nest with rigid rays. Free spines radiating, thin, narrow. |
| HRIGRU | 1049 3 | D. carota | | ssp carota var sativus | | Cultivated type. Orange root Paris Market Type (at seedling stage). Highly branched vigorous plant. Leaves cultivated type with elongated segments. Umbel cultivated type. |
| HRIGRU | 1049 4 | D. carota | | var sativus or hybrid cultivated X wild? | | Leaves and umbel cultivated type. At the seedling stage = white tuberous root enough (hybrid cultivated X wild?). |
| HRIGRU | 1049 7 | D. carota | | ND | | Plants badly developped. Plant rosette. Unrated. |
| HRIGRU | 1049 8 | D. carota | | ND | | Dead plants. |
| HRIGRU | 1116 2 | D. carota | | ND | | 5 dieback plants. Root rot. |
| HRIGRU | 1116 5 | D. carota | | ssp carota var carota | | 1 carota type vigorous plant . Other plants poorly developed. |
| HRIGRU | 1396 5 | Daucus sp | | var sativus or hybrid cultivated X wild? | | Leaves and umbel (very curved), cultivated type. At the seedling stage = white quite tuberous root (hybrid cultivated X wild?). |
| HRIGRU | 1396 6 | Daucus sp | | ssp carota var carota | homogenous | Habit carota, medium vigor. Basal leaves not fleshy, dull, divided, lanceolate. Bracts linear flexible. Soft rays. Umbel in cup with young fruits. Spines straight, radiant, free, fine. |
| HRIGRU | 1396 7 | Daucus sp | | ??, Mixture | heterogenous | Habit plants : 1 carota, 1 mauritanicus, 5 hybrids cultivated X wild. At seedling stage : not tuberous and white roots. |
| HRIGRU | 1396 8 | Daucus sp | | ssp carota | | Vigor medium. 1 single plant well developed, others poorly developped. |

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|----------|-----------|-----------------------|-------------------------------|--|---------------------|---|
| HRIGRU | 1396 9 | Daucus sp | | hybrid wild X cultivated | homogeneity average | Looking carota but leaves and umbels (separate umbels) of the cultivated type. Basal leaves ovate to lanceolate, cut, matt, not fleshy. Soft rays. Bracts linear flexible. Red central flower frequent, sometimes in group. Median mixed foliage, cultivated / carota / intermediary types. Good homogeneity except size and vigor. |
| HRIGRU | 7188 | Daucus durienna Lange | | Daucus durienna Lange | homogenous | Very early, so dessicated stage. Identity confirmed by fruits. |
| HRIGRU | 7997 | Daucus littoralis | | Daucus littoralis | homogenous | Very early, fruit stage in greenhouse, not transplanted to the field. Correct identity from fruits. |
| ACO/IRHS | 780 | D. carota | drepanensis | ssp drepanensis | homogenous | dwarf plant remaining at ground |
| ACO/IRHS | 786 | D. carota | commutatus | ssp commutatus | very homogenous | Typical commutatus : habit and cutout leaf |
| ACO/IRHS | 730 | D. carota | gummifer | intermediaire gummifer x carota | average homogeneity | Umbels in nest (majority), dome and flat. Bracts narrow. Spines straight, not confluent as of carota. |
| ACO/IRHS | 790 | D. carota | fontanesii | var fontanesii | average homogeneity | Plant var gummifer but not hooked fruits. 1 plant in bloom. Hairy stem but variable. Plant not robust and small (30cm). Broad foliage, fleshy. Bracts lanceolate elongated. Small flat umbels 5-6cm. Spines not confluent, straight. |
| ACO/IRHS | 770 | D. carota | hispanicus-fontanesii | var fontanesii | homogenous | Very hairy stem, zig-zag. Broad and fleshy foliage. Umbel bud stage. Bracts lanceolate (ogive). |
| ACO/IRHS | 775 | D. carota | brachycaulos | var brachycaulos | homogenous | Brachycaulos tall (65cm). Weakly hairy, stem zig-zag. Wide shiny fleshy leaf. Bracts lanceolate + / - elongated. Umbel bud stage. Leaves more divided than hispanicus. |
| ACO/IRHS | 706 | D. carota | maritimus | ssp maritimus | homogenous | Narrow foliage. Bracts linear. Flowers almost non-radiating. Umbels in nest or flat. Green but quite advanced fruits. |
| ACO/IRHS | 773 | D. carota | maritimus grande | ssp maritimus vigoureux, 1 plante hybride maritimus-brachycaulos | heterogenous | Allure maritimus. Foliage with narrow segments except one plant hybridized with gummifer. Basal leaves fleshy and shiny. |
| ACO/IRHS | 702 | D. carota | carota | ssp carota var carota | homogenous | Leaves not or somewhat fleshy. Habit carota. Soft rays. Bracts linear. Flowers a little radiant. Fruiting umbels nest. Many spines radiating, straight, free. |
| ACO/IRHS | 896 | D. carota | var. mauritanicus (L.) Spreng | var mauritanicus | | Var mauritanicus with a trend vigourous carota. Basal leaves segments with average width to wide. Bracts linear flexible. Fruiting umbels in closed nest. Small fruits with few spines, straight, free, radiant, moderately long. |

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|----------|-----|-----------|--------|------------|-----------------|---|
| ACO/IRHS | 879 | D. carota | carota | var carota | homogenous | var carota vigorous. Leaves medium to large divisions. Flexible bracts linear, dull. Soft rays. Great fruit. Spines fine, straight, radiant, long, free. |
| ACO/IRHS | 880 | D. carota | carota | var carota | homogenous | var carota average force. Habit carota. Basal leaves well cut, medium width (to a little large), dull, just fleshy. Bracts flexible linear. Soft rays. Radiant flowers. |
| ACO/IRHS | 886 | D. carota | carota | var carota | very homogenous | Habit carota slender, little leafy on top. Basal leaves well cut, medium width, dull, just fleshy. |
| ACO/IRHS | 887 | D. carota | carota | var carota | homogenous | Habit carota. Little leafy on top. Basal leaves base well cut, medium, dull, non-fleshy. Bracts linear flexible. Soft rays. Radiant flowers. Umbel nest. Spines straight, medium length, radiant. |

2012 batch

| SOURCE | ID | TAXON | Proposed new Identification | Observations |
|----------|-----|---------------|--|---|
| ACO/IRHS | 805 | gadecaei | <i>ssp gadecaei</i> | Very good compliance field. Plant plagiotropic outwardly. Pinkish inflorescences. 4 plants. |
| ACO/IRHS | 730 | gummifer | <i>ssp gummifer var gummifer</i> | Homogeneous. Very good compliance field. Height 55 cm. |
| ACO/IRHS | 798 | | <i>intermédiaire ssp carota X var fontanesii</i> | Relatively heterogeneous (also in field). Leaves type carota and fumbels fontanesii kind . Height 50-70 cm. 6 plants. |
| ACO/IRHS | 895 | | <i>ssp gummifer var fontanesii</i> | Fontanesii typical. Vigorous broad foliage, gummifer mediterannean. Good field compliance. Homogeneous. Height 70-100 cm. |
| ACO/IRHS | 898 | | <i>ssp gummifer var fontanesii</i> | Good field compliance. Fontanesii less typical, with influences carota? Heterogeneous. Height 70 cm. |
| ACO/IRHS | 786 | g. commutatus | <i>ssp commutatus</i> | Typical |
| ACO/IRHS | 706 | c. maritimus | <i>ssp maritimus</i> | Typical. Very good compliance field. Homogeneous. |

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|----------|-----|----------------------------------|---|---|
| ACO/IRHS | 702 | carota | <i>ssp carota var carota</i> | Compliance field. Height 120 cm. |
| ACO/IRHS | 704 | carota | <i>ssp carota var carota</i> | Meanest than in the field. Plant later or problem vernalization. Young inflorescences yellowish. Height 80-100 cm. |
| ACO/IRHS | 891 | Daucus carota L. subsp. ? | <i>subgroup gummifer</i> | Heterogeneous. Broad or and narrow linear leaves. Height 50-70 cm. |
| ACO/IRHS | 892 | Daucus carota L. subsp. ? | <i>subgroup gummifer</i> | Heterogeneous. Fleshy leaves or linear. Height 60-80 cm. |
| ACO/IRHS | 893 | Daucus carota L. subsp. ? | <i>subgroup gummifer</i> | Heterogeneous. Non-compliant field. 2 commutatus type plants. Other plants with linear or fleshy leaves. |
| ACO/IRHS | 894 | Daucus carota L. subsp. ? | <i>subgroup gummifer</i> | Non-compliant to the field: dwarf (15cm) drepanensis type in the original ground while here height 40-60 cm. Relatively homogeneous . No linear leaves. |
| ACO/IRHS | 897 | Daucus carota L. subsp. ? | <i>subgroup gummifer</i> | Consistent field. Very homogeneous. Dark green foliage. Height 55 cm. |
| ACO/IRHS | 900 | subgr. carota | <i>mix sg carota - sg gummifer</i> | Heterogeneous. Non-consistent field. 1 carota plant small and 2 plants small gummifer. Low and robust plants. Broad and linear leaves. Height 35 cm. |
| ACO/IRHS | 901 | Daucus carota L. subsp. ? | <i>Intermediate ssp carotaXgummifer</i> | Land consistent (but larger on land). Umbels half nest. Height 70-110 cm. |
| ACO/IRHS | 902 | Daucus carota L. subsp. ? | <i>subgroup gummifer</i> | No consistent with field (height 30 cm) for height (height 85cm.). Robust and large plants. |
| ACO/IRHS | 903 | Daucus carota L. subsp. ? | <i>Intermediate ssp carotaXgummifer</i> | Consistent field but stronger. Intermediate carota gummifer for leaves and umbels. Central flower very marked. |

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| ACO/IRHS | 782 | c. mauritanicus | <i>ssp carota var mauritanicus</i> | Compliant. Narrow leaves. Umbels wide (16-16-16cm diameter). Height 70-100 cm. |
| ACO/IRHS | 890 | subsp. maximus (Desf.) Ball | <i>ssp carota var mauritanicus</i> | Height 60-100 cm. Diameter umbels 11-11 cm. |
| ACO/IRHS | 896 | subsp. maximus (Dasf.) Ball | <i>ssp carota var mauritanicus</i> | Very good compliance. Mauritanicus strong (close maximus). Coarse foliage. Height 85-115 cm. 16cm diameter umbels. |
| ACO/IRHS | 814 | azoricus | <i>To be checked again</i> | |
| ACO/IRHS | 656 | muricatus | <i>Daucus muricatus</i> | Typical: unequal rays, plant very early, large fruits. |
| ACO/IRHS | 899 | | <i>ssp gummifer var fontanesii</i> | Very good compliance field. Wide foliage. Flower plant multiple. Near N06. |
| HRIGRU | 9202 | ssp. gadeceai (Rouy & Camus) Heywood | <i>intermediate ssp gummifer X gadeceai</i> | Plant taller and more vigorous than gadeceai plagiotropic inflorescences |
| HRIGRU | 7161 | ssp. gummifer Hooker fil. | <i>Intermediate ssp carota X gummifer</i> | High ramification Slender plant Carota type leaves |
| HRIGRU | 7159 | gingidium | <i>ssp gummifer var gummifer</i> | Plant height 30cm Stocky plant Term gingidium to be revised |
| HRIGRU | 9201 | commutatus | <i>ssp gummifer (var fontanesii?)</i> | plant height 55-70cm big umbels 15 cm diameter not commutatus type leaves vigourous plants |
| HRIGRU | 7388 | ssp. maritimus (Lam.) Batt. | <i>ssp sativus</i> | Cultivated type leaves and umbels Plant height 110cm |

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| HRIGRU | 8001 | Daucus sp | <i>ssp carota var carota</i> | plant height 70cm |
| HRIGRU | 8002 | Daucus sp | <i>ssp carota (var mauritanicus?)</i> | Plant height 105cm Umbel diam 14cm Homogenous origin? |
| HRIGRU | 8716 | D.c. | <i>ssp gummifer var gummifer</i> | very typical plantheight 30cm Dense and domed umbels |
| HRIGRU | 9226 | D.c. | <i>ssp carota var carota</i> | Pink umbels Plant height 75-100cm original |
| HRIGRU | 9270 | D.c. | <i>ssp carota var carota</i> | plants in bad shape |
| HRIGRU | 10495 | Binyomina N°1 wild/sativus? | <i>ssp sativus</i> | Plant height 85-110cm 2 non bolting / 8 |
| HRIGRU | 12423 | Daucus sp | <i>ssp carota var carota</i> | Plant height 90cm |
| HRIGRU | 13208 | D.c. | <i>ssp carota var carota</i> | 1 cultivated type plant pollution? plant height 85cm heterogenous |
| HRIGRU | 13962 | Daucus sp | <i>ssp carota (var mauritanicus?)</i> | similar to 8002 bad sanitary status plant height 90-100 |
| HRIGRU | 13963 | Daucus sp | <i>ssp carota var carota</i> | Height 135cm. Umbel diameter 13cm. |
| HRIGRU | 13964 | Daucus sp | <i>ssp carota var carota</i> | bad sanitary status |

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| HRIGRU | 9218 | ssp. maximus (Desf.) Ball | <i>ssp carota var carota</i> | plant height 70cm |
| HRIGRU | 6667 | azoricus Franco | <i>ssp gummifer (var fontanesii? halophilus?)</i> | Not azoricus Pinkish umbels |
| HRIGRU | 7189 | D. hispidifolius Clos. | <i>to be checked again</i> | Homogenous. To be checked again for identification. |
| HRIGRU | 7190 | capillifolius | <i>Daucus capillifolius</i> | typical |
| IPK | DAU 217 | D.c. major | <i>ssp carota var carota</i> | Frail plant. Little foliage, upright. |
| IPK | DAU 257 | D.c. maximus | <i>ssp carota var carota</i> | Light green leaves. Carota with cultured influence? Height 90 cm. |