

= Narcissus ( plant ) =

*Narcissus* / n??r?s?s / is a genus of predominantly spring perennial plants in the Amaryllidaceae ( amaryllis ) family . Various common names including daffodil , daffadowndilly , narcissus , and jonquil are used to describe all or some members of the genus . *Narcissus* has conspicuous flowers with six petal @-@ like tepals surmounted by a cup- or trumpet @-@ shaped corona . The flowers are generally white or yellow ( orange or pink in garden varieties ) , with either uniform or contrasting coloured tepals and corona .

*Narcissus* were well known in ancient civilisation , both medicinally and botanically , but formally described by Linnaeus in his *Species Plantarum* ( 1753 ) . The genus is generally considered to have about ten sections with approximately 50 species . The number of species has varied , depending on how they are classified , due to similarity between species and hybridization . The genus arose some time in the Late Oligocene to Early Miocene epochs , in the Iberian peninsula and adjacent areas of southwest Europe . The exact origin of the name *Narcissus* is unknown , but it is often linked to a Greek word for intoxicated ( narcotic ) and the myth of the youth of that name who fell in love with his own reflection . The English word ' daffodil ' appears to be derived from " asphodel " , with which it was commonly compared .

The species are native to meadows and woods in southern Europe and North Africa with a center of diversity in the Western Mediterranean , particularly the Iberian peninsula . Both wild and cultivated plants have naturalised widely , and were introduced into the Far East prior to the tenth century . *Narcissi* tend to be long @-@ lived bulbs , which propagate by division , but are also insect @-@ pollinated . Known pests , diseases and disorders include viruses , fungi , the larvae of flies , mites and nematodes . Some *Narcissus* species have become extinct , while others are threatened by increasing urbanisation and tourism .

Historical accounts suggest *narcissi* have been cultivated from the earliest times , but became increasingly popular in Europe after the 16th century and by the late 19th century were an important commercial crop centred primarily on the Netherlands . Today *narcissi* are popular as cut flowers and as ornamental plants in private and public gardens . The long history of breeding has resulted in thousands of different cultivars . For horticultural purposes , *narcissi* are classified into divisions , covering a wide range of shapes and colours . Like other members of their family , *narcissi* produce a number of different alkaloids , which provide some protection for the plant , but may be poisonous if accidentally ingested . This property has been exploited for medicinal use in traditional healing and has resulted in the production of galantamine for the treatment of Alzheimer 's dementia . Long celebrated in art and literature , *narcissi* are associated with a number of themes in different cultures , ranging from death to good fortune , and as symbols of spring . The daffodil is the national flower of Wales and the symbol of cancer charities in many countries . The appearance of the wild flowers in spring is associated with festivals in many places .

= = Description = =

= = = General = = =

*Narcissus* is a genus of perennial herbaceous bulbiferous geophytes , dying back after flowering to an underground storage bulb . They regrow in the following year from brown @-@ skinned ovoid bulbs with pronounced necks , and reach heights of 5 ? 80 cm depending on the species . Dwarf species such as *N. asturiensis* have a maximum height of 5 ? 8 cm , while *Narcissus tazetta* may grow as tall as 80 cm .

The plants are scapose , having a single central leafless hollow flower stem ( scape ) . Several green or blue @-@ green , narrow , strap @-@ shaped leaves arise from the bulb . The plant stem usually bears a solitary flower , but occasionally a cluster of flowers ( umbel ) . The flowers , which are usually conspicuous and white or yellow , sometimes both or rarely green , consist of a perianth of three parts . Closest to the stem ( proximal ) is a floral tube above the ovary , then an outer ring

composed of six tepals ( undifferentiated sepals and petals ) , and a central disc to conical shaped corona . The flowers may hang down ( pendent ) , or be erect . There are six pollen bearing stamens surrounding a central style . The ovary is inferior ( below the floral parts ) consisting of three chambers ( trilocular ) . The fruit consists of a dry capsule that splits ( dehisces ) releasing numerous black seeds .

The bulb lies dormant after the leaves and flower stem die back and has contractile roots that pull it down further into the soil . The flower stem and leaves form in the bulb , to emerge the following season . Most species are dormant from summer to late winter , flowering in the spring , though a few species are autumn flowering .

= = = Specific = = =

= = = = Vegetative = = = =

### Bulbs

The pale brown @-@ skinned ovoid tunicate bulbs have a membranous tunic and a corky stem ( base or basal ) plate from which arise the adventitious root hairs in a ring around the edge , which grow up to 40 mm in length . Above the stem plate is the storage organ consisting of bulb scales , surrounding the previous flower stalk and the terminal bud . The scales are of two types , true storage organs and the bases of the foliage leaves . These have a thicker tip and a scar from where the leaf lamina became detached . The innermost leaf scale is semicircular only partly enveloping the flower stalk ( semisheathed ) . ( see Hanks Fig 1 @.@ 3 ) . The bulb may contain a number of branched bulb units , each with two to three true scales and two to three leaf bases . Each bulb unit has a life of about four years .

Once the leaves die back in summer , the roots also wither . After some years , the roots shorten pulling the bulbs deeper into the ground ( contractile roots ) . The bulbs develop from the inside , pushing the older layers outwards which become brown and dry , forming an outer shell , the tunic or skin . Up to 60 layers have been counted in some wild species . While the plant appears dormant above the ground the flower stalk which will start to grow in the following spring , develops within the bulb surrounded by two to three deciduous leaves and their sheaths . The flower stem lies in the axil of the second true leaf .

### Stems

The single leafless stem or scape , appearing from early to late spring depending on the species , bears from 1 to 20 blooms . Stem shape depends on the species , some are highly compressed with a visible seam , while others are rounded . The stems are upright and located at the centre of the leaves . In a few species such as *N. hedraeanthus* the stem is oblique ( asymmetrical ) . The stem is hollow in the upper portion but towards the bulb is more solid and filled with a spongy material .

### Leaves

Narcissus plants have one to several basal leaves which are linear , ligulate or strap shaped ( long and narrow ) , sometimes channelled adaxially to semiterete , and may ( pedicellate ) or may not ( sessile ) have a petiole stalk . The leaves are flat and broad to cylindrical at the base and arise from the bulb . The emerging plant generally has two leaves , but the mature plant usually three , rarely four , and they are covered with a cutin containing cuticle , giving them a waxy appearance . Leaf colour is light green to blue @-@ green . In the mature plant the leaves extend higher than the flower stem , but in some species the leaves are low hanging . The leaf base is encased in a colourless sheath . After flowering the leaves turn yellow and die back once the seed pod ( fruit ) is ripe .

Jonquils usually have dark green , round , rush @-@ like leaves .

= = = = Reproductive = = = =

### Inflorescence

The inflorescence is scapose , the single stem or scape bearing either a solitary flower or forming an umbel with up to 20 blooms . Species bearing a solitary flower include section *Bulbocodium* and most of section *Pseudonarcissus* . Umbellate species have a fleshy racemose inflorescence ( unbranched , with short floral stalks ) with 2 to 15 or 20 flowers , such as *N. papyraceus* ( see illustration , left ) and *N. tazetta* ( see Table I ) . The flower arrangement on the inflorescence may be either with ( pedicellate ) or without ( sessile ) floral stalks .

Prior to opening , the flower buds are enveloped and protected in a thin dry papery or membranous ( scarious ) spathe . The spathe consists of a singular bract that is ribbed , and which remains wrapped around the base of the open flower . As the bud grows , the spathe splits longitudinally . Bracteoles are small or absent .

#### Flowers

The flowers of *Narcissus* are hermaphroditic ( bisexual ) , have three parts ( tripartite ) , and are sometimes fragrant ( see Fragrances ) . The flower symmetry is actinomorphic ( radial ) to slightly zygomorphic ( bilateral ) due to declinate @-@ ascending stamens ( curving downwards , then bent up at the tip ) . *Narcissus* flowers are characterised by their , usually conspicuous , corona ( trumpet ) .

The three major floral parts ( in all species except *N. cavanillesii* in which the corona is virtually absent - Table I : Section *Tapeinanthus* ) are ;

- ( i ) the proximal floral tube ( hypanthium ) ,
- ( ii ) the surrounding free tepals , and
- ( iii ) the more distal corona ( paraperigon , paraperigonium ) .

All three parts may be considered to be components of the perianth ( perigon , perigonium ) . The perianth arises above the apex of the inferior ovary , its base forming the hypanthial floral tube .

The floral tube is formed by fusion of the basal segments of the tepals ( proximally connate ) . Its shape is from an inverted cone ( obconic ) to funnel @-@ shaped ( funneliform ) or cylindrical , and is surmounted by the more distal corona . Floral tubes can range from long and narrow in sections *Apodanthi* and *Jonquilla* to rudimentary ( *N. cavanillesii* ) .

Surrounding the floral tube and corona and reflexed ( bent back ) from the rest of the perianth are the six spreading tepals or floral leaves , in two whorls which may be distally ascending , reflexed ( folded back ) , or lanceolate . Like many monocotyledons , the perianth is homochlamydeous , that is undifferentiated into separate calyx ( sepals ) and corolla ( petals ) , but rather has six tepals . The three outer tepal segments may be considered sepals , and the three inner segments petals . The transition point between the floral tube and the corona is marked by the insertion of the free tepals on the fused perianth .

The corona , or paracorolla , is variously described as bell @-@ shaped ( funneliform , trumpet ) , bowl @-@ shaped ( cupular , crateriform , cup shaped ) or disc @-@ shaped with margins that are often frilled , and is free from the stamens . Rarely the corona is a simple callose ( hardened , thickened ) ring . The corona is formed during floral development as a tubular outgrowth from stamens which fuse into a tubular structure , the anthers becoming reduced . At its base the fragrances which attract pollinators are formed . All species produce nectar at the top of the ovary . Coronal morphology varies from the tiny pigmented disk of *N. serotinus* ( see Table I ) or the rudimentary structure in *N. cavanillesii* to the elongated trumpets of section *Pseudonarcissus* ( trumpet daffodils , Table I ) .

While the perianth may point forwards , in some species such as *N. cyclamineus* it is folded back ( reflexed , see illustration , left ) , while in some other species such as *N. bulbocodium* ( Table I ) , it is reduced to a few barely visible pointed segments with a prominent corona .

The colour of the perianth is white , yellow or bicoloured , with the exception of the night flowering *N. viridiflorus* which is green . In addition the corona of *N. poeticus* has a red crenulate margin ( see Table I ) . Flower diameter varies from 12 mm ( *N. bulbocodium* ) to over 125 mm ( *N. nobilis* = *N. pseudonarcissus* subsp. *nobilis* ) .

Flower orientation varies from pendent or deflexed ( hanging down ) as in *N. triandrus* ( see illustration , left ) , through declinate @-@ ascendant as in *N. alpestris* = *N. pseudonarcissus* subsp. *moschatatus* , horizontal ( patent , spreading ) such as *N. gaditanus* or *N. poeticus* , erect as in *N.*

cavanillesii , N. serotinus and N. rupicola ( Table I ) , or intermediate between these positions ( erecto @-@ patent ) .

The flowers of Narcissus demonstrate exceptional floral diversity and sexual polymorphism , primarily by corona size and floral tube length , associated with pollinator groups ( see for instance Figs . 1 and 2 in Graham and Barrett ) . Barrett and Harder ( 2005 ) describe three separate floral patterns ;

'Daffodil ' form

'Paperwhite ' form

'Triandrus ' form .

The predominant patterns are the ' daffodil ' and ' paperwhite ' forms , while the ' triandrus ' form is less common . Each corresponds to a different group of pollinators ( See Pollination ) .

The ' daffodil ' form , which includes sections Pseudonarcissus and Bulbocodium , has a relatively short , broad or highly funnelform tube ( funnel @-@ like ) , which grades into an elongated corona , which is large and funnelform , forming a broad , cylindrical or trumpet @-@ shaped perianth . Section Pseudonarcissus consists of relatively large flowers with a corolla length of around 50mm , generally solitary but rarely in inflorescences of 2 @-@ 4 flowers . They have wide greenish floral tubes with funnel shaped bright yellow coronas . The six tepals sometimes differ in colour from the corona and may be cream coloured to pale yellow .

The ' paperwhite ' form , including sections Jonquilla , Apodanthi and Narcissus , has a relatively long , narrow tube and a short , shallow , flaring corona . The flower is horizontal and fragrant .

The ' triandrus ' form is seen in only two species , N. albimarginatus ( a Moroccan endemic ) and N. triandrus . It combines features of both the ' daffodil ' and ' paperwhite ' forms , with a well @-@ developed , long , narrow tube and an extended bell @-@ shaped corona of almost equal length . The flowers are pendent .

Androecium

There are six stamens in one to two rows ( whorls ) , with the filaments separate from the corona , attached at the throat or base of the tube ( epipetalous ) , often of two separate lengths , straight or declinate @-@ ascending ( curving downwards , then upwards ) . The anthers are basifixed ( attached at their base ) .

Gynoecium

The ovary is inferior ( below the floral parts ) and trilocular ( three chambered ) and there is a pistil with a minutely three lobed stigma and filiform ( thread like ) style , which is often exserted ( extending beyond the tube ) .

Fruit

The fruit consists of dehiscent loculicidal capsules ( splitting between the locules ) that are ellipsoid to subglobose ( almost spherical ) in shape and are papery to leathery in texture .

Seeds

The fruit contains numerous subglobose seeds which are round and swollen with a hard coat , sometimes with an attached elaiosome . The testa is black and the pericarp dry .

Most species have 12 ovules and 36 seeds , although some species such as N. bulbocodium have more , up to a maximum of 60 . Seeds take five to six weeks to mature . The seeds of sections Jonquilla and Bulbocodium are wedge @-@ shaped and matte black , while those of other sections are ovate and glossy black . A gust of wind or contact with a passing animal is sufficient to disperse the mature seeds .

= = = Chromosomes = = =

Chromosome numbers :  $2n = 14, 22, 26$  , with numerous aneuploid and polyploid derivatives . The basic chromosome number being 7 , with the exception of N. tazetta , N. elegans and N. broussonetii in which it is 10 or 11 , chromosome number being the way that this subgenus ( Hermione ) was characterised . Polyploid species include N. papyraceus (  $4x = 22$  ) and N. dubius (  $6x = 50$  ) .

## === Phytochemistry ===

### ==== Alkaloids ====

As with all Amaryllidaceae genera , Narcissus contains unique isoquinoline alkaloids . The first alkaloid to be identified was lycorine , from *N. pseudonarcissus* in 1877 . These are considered a protective adaptation , and are utilised in the classification of species . Nearly 100 alkaloids have been identified in the genus , about a third of all known Amaryllidaceae alkaloids , although not all species have been tested . Of the nine alkaloid ring types identified in the family , Narcissus species most commonly demonstrate the presence of alkaloids from within the Lycorine ( lycorine , galanthine , pluviine ) and Homolycorine ( homolycorine , lycorenine ) groups . Hemanthamine , Tazettine , Narciclasine , Montanine and Galantamine alkaloids are also represented . The alkaloid profile of any plant varies with time , location , and developmental stage . Narcissus also contain fructans and low molecular weight glucomannan in the leaves and plant stems .

### ==== Fragrances ====

Fragrances are predominantly monoterpene isoprenoids , with a small amount of benzenoids , although *N. jonquilla* has both equally represented . Another exception is *N. cuatrecasasii* which produces mainly fatty acid derivatives . The basic monoterpene precursor is geranyl pyrophosphate , and the commonest monoterpenes are limonene , myrcene , and trans  $\alpha$ - $\beta$  ocimene . Most benzenoids are non  $\alpha$ - $\beta$  methoxylated , while a few species contain methoxylated forms ( ethers ) , e.g. *N. bugei* . Other ingredients include indole , isopentenoids and very small amounts of sesquiterpenes . Fragrance patterns can be correlated with pollinators , and fall into three main groups ( see Pollination ) .

### == Taxonomy ==

### === History ===

Genus valde intricatum et numerosissimis dubiis oppressum

A genus that is very complex and burdened with numerous uncertainties

### ==== Early ====

The genus *Narcissus* was well known to the ancients . In Greek literature Theophrastus and Dioscorides described ????????? , probably referring to *N. poeticus* , although the exact species mentioned in classical literature cannot be accurately established . Pliny the Elder later introduced the Latin form *narcissus* . These early writers were as much interested in the plant 's possible medicinal properties as they were its botanical features and their accounts remained influential until at least the Renaissance ( see also Antiquity ) . Mediaeval and Renaissance writers include Albert Magnus and William Turner , but it remained to Linnaeus to formally describe and name *Narcissus* as a genus in his *Species Plantarum* ( 1753 ) at which time there were six known species .

### ==== Modern ====

De Jussieu ( 1789 ) grouped *Narcissus* into a ' family ' which he called *Narcissi* . This was renamed *Amaryllideae* by Jaume Saint Hilaire in 1805 , corresponding to the modern Amaryllidaceae . For a while *Narcissus* was considered part of *Liliaceae* ( as in the illustration seen here of *Narcissus candidissimus* ) , but then the Amaryllidaceae were split off from it .

Various authors have adopted either narrow ( e.g. Haworth , Salisbury ) or wide ( e.g. Herbert ,

Spach ) interpretations of the genus . The narrow view treated many of the species as separate genera . Over time the wider view prevailed with a major monograph on the genus being published by Baker ( 1875 ) . One of the more controversial genera was Tapeinanthus , but today it is included in Narcissus .

The eventual position of Narcissus within the Amaryllidaceae family only became settled in this century with the advent of phylogenetic analysis and the Angiosperm Phylogeny Group system . Within Amaryllidaceae the genus Narcissus belongs to the Narcisseae tribe , one of 13 within the Amaryllidoideae subfamily . It is one of two sister clades corresponding to genera in the Narcisseae , being distinguished from Sternbergia by the presence of a paraperigonium , and is monophyletic .

= = = Subdivision = = =

The infrageneric phylogeny of Narcissus still remains relatively unsettled , the taxonomy having proved complex and difficult to resolve , due to the diversity of the wild species , the ease with which natural hybridization occurs , and extensive cultivation and breeding accompanied by escape and naturalisation . Consequently , the number of accepted species has varied widely .

De Candolle , in the first systematic taxonomy of Narcissus , arranged the species into named groups , and those names have largely endured for the various subdivisions since and bear his name as their authority . The situation was confused by the inclusion of many unknown or garden varieties , and it was not till the work of Baker that the wild species were all grouped as sections under one genus , Narcissus .

A common classification system has been that of Fernandes based on cytology , as modified by Blanchard ( 1990 ) and Mathew ( 2002 ) . Another is that of Meyer ( 1966 ) . Fernandes proposed two subgenera based on basal chromosome number , and then subdivided these into ten sections as did Blanchard .

Other authors ( e.g. Webb ) prioritised morphology over genetics , abandoning subgenera , although Blanchard 's system has been one of the most influential . While infrageneric groupings within Narcissus have been relatively constant , their status ( genera , subgenera , sections , subsections , series , species ) has not . The most cited system is that of the Royal Horticultural Society ( RHS ) which simply lists ten sections . Three of these are monotypic ( contain only one species ) , while two others contain only two species . Most species are placed in section Pseudonarcissus . Many of these subdivisions correspond roughly to the popular names for daffodil types , e.g. Trumpet Daffodils , Tazettas , Pheasant 's Eyes , Hoop Petticoats , Jonquils .

The most hierarchical system is that of Mathew , illustrated here -

= = = = Phylogenetics = = = =

The phylogenetic analysis of Graham and Barrett ( 2004 ) supported the infrageneric division of Narcissus into two clades corresponding to Fernandes ' subgenera , but did not support monophyly of all sections . A later extended analysis by Rønsted et. al . ( 2008 ) with additional taxa confirmed this pattern .

A large molecular analysis by Zonneveld ( 2008 ) sought to reduce some of the paraphyly identified by Graham and Barrett . This led to a revision of the sectional structure . While Graham and Barrett ( 2004 ) had determined that subgenus Hermione was monophyletic , Santos @-@ Gally et. al . ( 2011 ) did not . If two species excluded in the former study are removed from the analysis , the studies are in agreement , the species in question instead forming a clade with subgenus Narcissus . Some so @-@ called nothosections have been proposed , to accommodate natural ( ' ancient ' ) hybrids ( nothospecies ) .

= = = = Species = = = =

Estimates of the number of species in Narcissus have varied widely , from anywhere between 16 and almost 160 , even in the modern era . Linnaeus originally included six species in 1753 , by 1784

there were fourteen by 1819 sixteen , and by 1831 Adrian Haworth had described 150 species .

Much of the variation lies in the definition of species . Thus , a very wide view of each species , such as Webb 's results in few species , while a very narrow view such as that of Fernandes results in a larger number . Another factor is the status of hybrids , with a distinction between ' ancient hybrids ' and ' recent hybrids ' . The term ' ancient hybrid ' refers to hybrids found growing over a large area , and therefore now considered as separate species , while ' recent hybrid ' refers to solitary plants found amongst their parents , with a more restricted range .

Fernandes ( 1951 ) originally accepted 22 species , Webb ( 1980 ) 27 . By 1968 , Fernandes had 63 species , Blanchard ( 1990 ) 65 species , and Erhardt ( 1993 ) 66 . In 2006 the Royal Horticultural Society 's ( RHS ) International Daffodil Register and Classified List listed 87 species , while Zonneveld 's genetic study ( 2008 ) resulted in only 36 . As of September 2014 , the World Checklist of Selected Plant Families accepts 52 species , along with at least 60 hybrids , while the RHS has 81 accepted names in its October 2014 list .

= = = Evolution = = =

Within the Narcisseae , *Narcissus* ( western Mediterranean ) diverged from *Sternbergia* ( Eurasia ) some time in the Late Oligocene to Early Miocene eras , around 29 @. @ 3 ? 18 @. @ 1 Ma . Later the genus divided into the two subgenera ( *Hermione* and *Narcissus* ) between 27 @. @ 4 ? 16 @. @ 1 Ma . The divisions between the sections of *Hermione* then took place during the Miocene period 19 @. @ 9 ? 7 @. @ 8 Ma . *Narcissus* appears to have arisen in the area of the Iberian peninsula , southern France and north @-@ western Italy . Subgenus *Hermione* in turn arose in the southwestern mediterranean and north west Africa .

= = = Etymology = = =

= = = = *Narcissus* = = = =

The derivation of the Latin *narcissus* ( Greek : ????????? ) is unknown , but may be connected with hell . It is frequently linked to the myth of *Narcissus* who became so obsessed with his own reflection in water that he drowned and the narcissus plant sprang from where he died . There is no evidence for the flower being named for the youth . *Narcissus poeticus* which grows in Greece , has a fragrance that has been described as intoxicating . Pliny wrote that the plant was named for its fragrance ( ?????? narkao , " I grow numb " ) not the youth . Furthermore , there were accounts of narcissi growing long before the story of *Narcissus* appeared ( see Greek culture ) . It has also been suggested that daffodils bending over streams represent the youth admiring his reflection . Linnaeus used the Latin name ' *narcissus* ' for the plant but was preceded by others such as Matthias de l 'Obel ( 1591 ) and Clusius ( 1576 ) . The name *Narcissus* was not uncommon for men in Roman times .

The plural form of the common name " narcissus " has caused some confusion . Dictionaries list " narcissi " , " narcissuses " and " narcissus " . However , texts on usage such as Garner and Fowler state that " narcissi " is the preferred form . The common name narcissus should not be capitalised .

= = = = Daffodil = = = =

The name " daffodil " is derived from " affodell " , a variant of asphodel . The narcissus was frequently , referred to as the asphodel , ( see Antiquity ) . Asphodel in turn appears to come from the Greek " asphodelos " ( Greek : ????????? ) . The reason for the introduction of the initial " d " is not known . From at least the 16th century , " Daffadown Dilly " , " daffadown dilly " , and " daffydowndilly " have appeared as alternative names .

Other names include " Lent lily " .

= = Distribution and habitat = =

= = = Distribution = = =

Although the Amaryllidaceae family are predominantly tropical or subtropical as a whole , *Narcissus* occurs primarily in Mediterranean region , with a centre of diversity in the Iberian Peninsula ( Spain and Portugal ) . A few species extend the range into southern France , Italy , and the Balkans ( *N. poeticus* , *N. serotinus* , *N. tazetta* ) and the Eastern Mediterranean ( *N. serotinus* ) including Israel ( *N. tazetta* ) . The occurrence of *N. tazetta* in western and central Asia , China and Japan are considered introductions , albeit ancient ( see Eastern cultures ) . While the exact northern limit of the range is unknown , the occurrences of wild *N. pseudonarcissus* in Great Britain , middle and northern Europe are similarly considered ancient introductions .

While Amaryllidaceae is not native to North America , it grows well in USDA hardiness zones 3B through 10 , encompassing most of the country .

*N. elegans* occurs on the North West African Coast ( Morocco and Libya ) , as well as the coastline of Corsica , Sardinia and Italy , and *N. bulbocodium* between Tangier and Algiers and Tangier to Marrakech , but also on the Iberian Peninsula . *N. serotinus* is found along the entire Mediterranean coast . *N. tazetta* occurs as far east as Iran and Kashmir . Since this is one of the oldest species found in cultivation , it is likely to have been introduced into Kashmir . *N. poeticus* and *N. pseudonarcissus* have the largest distribution ranges . *N. poeticus* ranges from the Pyrenees along the Romanian Carpathians to the Black Sea and along the Dalmatian coast to Greece . *N. pseudonarcissus* ranges from the Iberian Peninsula , via the Vosges Mountains to northern France and Belgium , and the United Kingdom where there are still wild stocks in Southern Scotland . The only occurrence in Luxembourg is located near Lellingen , in the municipality of Kiischpelt . In Germany it is found mainly in the nature reserve at Perlenbach @-@ Fuhrtsbachtal and the Eifel National Park , where in the spring at Monschau the meadows are teeming with yellow blooms . One of the most easterly occurrences can be found at Misselberg near Nassau on the Lahn .

However unlike the above examples most species have very restricted endemic ranges which may overlap resulting in natural hybrids . For instance in the vicinity of the Portuguese city of Porto where both *N. pseudonarcissus* and *N. triandrus* occur there are found various intersections of the two species while in a small area along part of the Portuguese Montego river are found intersectional hybrids between *N. scaberulus* and *N. triandrus* .

The biogeography demonstrates a phylogenetic association , for instance subgenus *Hermione* having a lowland distribution , but subgenus *Narcissus* section *Apodanthi* being montane and restricted to Morocco , Spain and Portugal . The remaining sections within subgenus *Narcissus* include both lowland and mountain habitats . Section *Pseudonarcissus* , although widely naturalised is endemic to the Baetic Ranges of the south eastern Iberian peninsula .

= = = Habitats = = =

Their native habitats are very varied , with different elevations , bioclimatic areas and substrates , being found predominantly in open spaces ranging from low marshes to rocky hillsides and montane pastures , and including grassland , scrub , woods , river banks and rocky crevices . Although requirements vary , overall there is a preference for acidic soils , although some species will grow on limestone . *Narcissus scaberulus* will grow on granite soils where it is moist in the growing season but dry in the summer , while *Narcissus dubius* thrives best in regions with hot and dry summers .

The *Pseudonarcissus* group in their natural habitat prefer humid situations such as stream margins , springs , wet pastures , clearings of forests or shrublands with humid soils , and moist hillsides . These habitats tend to be discontinuous in the Mediterranean mountains , producing discrete isolated populations . In Germany , which has relatively little limestone , *Narcissus pseudonarcissus* grows in small groups on open mountain meadows or in mixed forests of fir , beech , oak , alder , ash and birch trees with well @-@ drained soil .



= = Ecology = =

= = = Life cycle = = =

Narcissus are long @-@ lived perennial geophytes with winter @-@ growing and summer @-@ dormant bulbs that are mainly synanthous ( leaves and flowers appearing at the same time ) . While most species flower in late winter to spring , five species are autumn flowering ( *N. broussonetii* , *N. cavanillesii* , *N. elegans* , *N. serotinus* , *N. viridiflorus* ) . By contrast these species are hysteroanthous ( leaves appear after flowering ) .

Flower longevity varies by species and conditions , ranging from 5 ? 20 days . After flowering leaf and root senescence sets in , and the plant appears to be ' dormant ' till the next spring , conserving moisture . However the dormant period is also one of considerable activity within the bulb primordia . It is also a period during which the plant bulb may be susceptible to predators ( see Pests and diseases below ) . Like many bulb plants from temperate regions , a period of exposure to cold is necessary before spring growth can begin . This protects the plant from growth during winter when intense cold may damage it . Warmer spring temperatures then initiate growth from the bulb . Early spring growth confers a number of advantages , including relative lack of competition for pollinators , and lack of deciduous shading . The exception to requiring cold temperatures to initiate flowering is *N. tazetta* .

Plants may spread clonally through the production of daughter bulbs and division producing clumps . Narcissus species hybridise readily , although the fertility of the offspring will depend on the parental relationship .

= = = Pollination = = =

The flowers are insect pollinated , the major pollinators being bees , butterflies , flies , and hawkmoths , while the highly scented night flowering *N. viridiflorus* is pollinated by crepuscular moths . Pollination mechanism fall into three groups corresponding to floral morphology ( see Description - Flowers ) .

'Daffodil ' form . Pollinated by bees seeking pollen from anthers within the corona . The broad perianth allows bees ( *Bombus* , *Anthophora* , *Andrena* ) to completely enter the flower in their search for nectar and / or pollen . In this type the stigma lies in the mouth of the corona , extending beyond the six anthers , whose single whorl lies well within the corona . The bees come into contact with the stigma before their legs , thorax and abdomen contact the anthers , and this approach herkogamy causes cross pollination .

'Paperwhite ' form . These are adapted to long @-@ tongued Lepidoptera , particularly sphingid moths such as *Macroglossum* , *Pieridae* and *Nymphalidae* but also some long @-@ tongued bees , and flies , all of which are primarily seeking nectar . The narrow tube admits only the insect 's proboscis , while the short corona serves as a funnel guiding the tip of the proboscis into the mouth of the perianth tube . The stigma is placed either in the mouth of the tube , just above two whorls of three anthers , or hidden well below the anthers . The pollinators then carry pollen on their probosci or faces . The long tongued bees cannot reach the nectar at the tube base and so collect just pollen .

'Triandrus ' form . Pollinated by long @-@ tongued solitary bees ( *Anthophora* , *Bombus* ) which forage for both pollen and nectar . The large corona allows the bees to crawl into the perianth but then the narrow tube prevents further progress , causing them to probe deeply for nectar . The pendant flowers prevent pollination by lepidoptera . In *N. albimarginatus* there may be either a long stigma with short and mid length anthers or a short stigma and long anthers ( dimorphism ) . In *N. triandrus* there are three patterns of sexual organs ( trimorphism ) but all have long upper anthers but vary in stigma position and the length of the lower anthers .

Allogamy ( outcrossing ) on the whole is enforced through a late @-@ acting ( ovarian ) self @-@

incompatibility system , but some species such as *N. dubius* and *N. longispathus* are self @-@ compatible producing mixtures of selfed and outcrossed seeds .

= = = Pests and diseases = = =

Diseases of *Narcissus* are of concern because of the economic consequences of losses in commercial cultivation . Pests include viruses , bacteria , and fungi as well as arthropods and gastropods . For control of pests , see Commercial uses .

#### Viruses

Aphids such as *Macrosiphum euphorbiae* can transmit viral diseases which affect the colour and shape of the leaves , as can Nematodes . Up to twenty five viruses have been described as being able to infect narcissi . These include the *Narcissus* common latent virus ( NCLV , *Narcissus* mottling @-@ associated virus ) , *Narcissus* latent virus ( NLV , *Narcissus* mild mottle virus ) which causes green mottling near leaf tips , *Narcissus* degeneration virus ( NDV ) , *Narcissus* late season yellows virus ( NLSYV ) which occurs after flowering , streaking the leaves and stems , *Narcissus* mosaic virus , *Narcissus* yellow stripe virus ( NYSV , *Narcissus* yellow streak virus ) , *Narcissus* tip necrosis virus ( NTN ) which produces necrosis of leaf tips after flowering and *Narcissus* white streak virus ( NWSV ) .

Less host specific viruses include Raspberry ringspot virus , *Nerine* latent virus ( NeLV ) = *Narcissus* symptomless virus , *Arabis* mosaic virus ( ArMV ) , Broad Bean Wilt Viruses ( BBWV ) Cucumber mosaic virus ( CMV ) , Tomato black ring virus ( TBRV ) , Tomato ringspot virus ( TomRSV ) and Tobacco rattle virus ( TRV ) .

Of these viruses the most serious and prevalent are NDV , NYSV and NWSV . NDV is associated with chlorotic leaf striping in *N. tazetta* . Infection with NYSV produces light or grayish green , or yellow stripes or mottles on the upper two @-@ thirds of the leaf , which may be roughened or twisted . The flowers which may be smaller than usual may also be streaked or blotched . NWSV produces greenish purple streaking on the leaves and stem turning white to yellow , and premature senescence reducing bulb size and yield . These viruses are primarily diseases of commercial nurseries . The growth inhibition caused by viral infection can cause substantial economic damage .

#### Bacteria

Bacterial disease is uncommon in *Narcissus* but includes *Pseudomonas* ( bacterial streak ) and *Pectobacterium carotovorum* sp. *carotovorum* ( bacterial soft rot ) .

#### Fungi

More problematic for non @-@ commercial plants is the fungus , *Fusarium oxysporum* f. sp. *narcissi* , which causes basal rot ( rotting of the bulbs and yellowing of the leaves ) . This is the most serious disease of *Narcissus* . Since the fungus can remain in the soil for many years it is necessary to remove infected plants immediately , and to avoid planting further narcissi at that spot for a further five years . Not all species and cultivars are equally susceptible . Relatively resistant forms include *N. triandrus* , *N. tazetta* and *N. jonquilla* .

Another fungus which attacks the bulbs , causing narcissus smoulder , is *Botrytis narcissicola* ( *Sclerotinia narcissicola* ) and other species of *Botrytis* , including *Botrytis cinerea* , particularly if improperly stored . Copper sulfate is used to combat the disease , and infected bulbs are burned . Blue mould rot of bulbs may be caused by infection with species of *Penicillium* , if they have become damaged either through mechanical injury or infestation by mites ( see below ) . Species of *Rhizopus* ( e.g. *Rhizopus stolonifer* , *Rhizopus nigricans* ) cause bulb soft rot and *Sclerotinia bulborum* , black slime disease . A combination of both *Peyronellaea curtisii* ( *Stagonosporopsis curtisii* ) and *Botrytis narcissicola* causes neck rot in the bulbs .

Fungi affecting the roots include *Nectria radicola* ( *Cylindrocarpon destructans* ) , a cause of root rot and *Rosellinia necatrix* causing white root rot , while others affect root and bulb , such as *Aspergillus niger* ( black mold ) , and species of *Trichoderma* , including *T. viride* and *T. harzianum* ( = *T. narcissi* ) responsible for green mold .

Other fungi affect the remainder of the plant . Another *Botrytis* fungus , *Botrytis polyblastis* ( *Sclerotinia polyblastis* ) causes brown spots on the flower buds and stems ( narcissus fire ) ,

especially in damp weather and is a threat to the cut flower industry . *Ramularia vallisumbrosae* is a leaf spot fungus found in warmer climates , causing narcissus white mould disease . *Peyronellaea curtisii* , the Narcissus leaf scorch , also affects the leaves as does its synanamorph , *Phoma narcissi* ( leaf tip blight ) . *Aecidium narcissi* causes rust lesions on leaves and stems .

#### Animals

Arthropods that are Narcissus pests include insects such as three species of fly that have larvae that attack the plants , narcissus bulb fly *Merodon equestris* , and two species of hoverflies , the lesser bulb flies *Eumerus tuberculatus* and *Eumerus strigatus* . The flies lay their eggs at the end of June in the ground around the narcissi , a single female fly being able to lay up to fifty eggs . The hatching larvae then burrow through the soil towards the bulbs and consume their interiors . They then overwinter in the empty bulb shell , emerging in April to pupate in the soil , from which the adult fly emerges in May . The larvae of some moths such as *Korscheltellus lupulina* ( the common swift moth ) attack Narcissus bulbs .

Other arthropods include Mites such as *Steneotarsonemus laticeps* ( Bulb scale mite ) , *Rhizoglyphus* and *Histiostoma* infest mainly stored bulbs and multiply particularly at high ambient temperature , but do not attack planted bulbs .

Planted bulbs are susceptible to nematodes , the most serious of which is *Ditylenchus dipsaci* ( Narcissus eelworm ) , the main cause of basal plate disease in which the leaves turn yellow and become misshapen . Infested bulbs have to be destroyed ; where infestation is heavy avoiding planting further narcissi for another five years . Other nematodes include *Aphelenchoides subtenuis* which penetrates the roots causing basal plate disease and *Pratylenchus penetrans* ( lesion nematode ) the main cause of root rot in narcissi . Other nematodes such as the longidorids ( *Longidorus* spp. or needle nematodes and *Xiphinema* spp. or dagger nematodes ) and the stubby @-@ root nematodes or trichodorids ( *Paratrichodorus* spp. and *Trichodorus* spp . ) can also act as vectors of virus diseases , such as TBRV and TomRSV , in addition to causing stunting of the roots .

Gastropods such as snails and slugs also cause damage to growth .

#### = = Conservation = =

Many of the smallest species have become extinct , requiring vigilance in the conservation of the wild species . Narcissi are increasingly under threat by over @-@ collection and threats to their natural habitats by urban development and tourism . *N. cyclamineus* has been considered to be either extinct or exceedingly rare but is not currently considered endangered , and is protected . The IUCN Red List describes five species as ' Endangered ' ( *Narcissus alcaracensis* , *Narcissus bujei* , *Narcissus longispathus* , *Narcissus nevadensis* , *Narcissus radinganorum* ) . In 1999 three species were considered endangered , five as vulnerable and six as rare .

In response a number of species have been granted protected species status and protected areas ( meadows ) have been established such as the Negra?i Daffodil Meadow in Romania , or Kempley Daffodil Meadow in the UK . These areas often host daffodil festivals in the spring .

#### = = Cultivation = =

#### = = = History = = =

Magna cura non indigent Narcissi

Most easy of cultivation is the Narcissus

Of all the flowering plants , the bulbous have been the most popular for cultivation . Of these , narcissi are one of the most important spring flowering bulb plants in the world . Indigenous in Europe , the wild populations of the parent species had been known since antiquity . Narcissi have been cultivated from at least as early as the sixteenth century in the Netherlands , when large numbers of bulbs were imported from the field , particularly *Narcissus hispanicus* which soon

became nearly extinct in its native habitat of France and Spain , though still found in the southern part of that country . The only large scale production at that time related to the double narcissus ' Van Sion ' and cultivars of *N. tazetta* imported in 1557 .

Cultivation is also documented in Britain at this time , although contemporary accounts show it was well known as a favourite garden and wild flower long before that and was used in making garlands . This was a period when the development of exotic formal gardens and parks was becoming popular , particularly in what is known as the ' Oriental Period ' ( 1560 ? 1620 ) . In his *Hortus Medicus* ( 1588 ) , the first catalogue of a German garden 's plants , Joachim Camerarius the Younger states that nine different types of daffodils were represented in his garden in Nuremberg . After his death in 1598 , his plants were moved by Basilius Besler to the gardens they had designed at Willibaldsburg , the bishop 's palace at Eichstätt , Upper Bavaria . That garden is described in Besler 's *Hortus Eystettensis* ( 1613 ) by which time there were 43 different types present . Another German source at this time was Peter Lauremberg who gives an account of the species known to him and their cultivation in his *Apparatus plantarius : de plantis bulbosis et de plantis tuberosis* ( 1632 ) .

While Shakespeare 's daffodil is the wild or true English daffodil ( *N. pseudonarcissus* ) , many other species were introduced , some of which escaped and naturalised , particularly *N. biflorus* ( a hybrid ) in Devon and the west of England . Gerard , in his extensive discussion of daffodils , both wild and cultivated ( " bastard daffodils " ) described twenty four species in London gardens ( 1597 ) , ( " we have them all and every one of them in our London gardens , in great abundance " , p . 114 ) .

In the early seventeenth century , Parkinson helped to ensure the popularity of the daffodil as a cultivated plant by describing a hundred different varieties in his *Paradisus Terrestris* ( 1629 ) , and introducing the great double yellow Spanish daffodil ( *Pseudonarcissus aureus Hispanicus flore pleno* or Parkinson 's Daffodil , see illustration ) to England .

I thinke none ever had this kind before myselfe nor did I myself ever see it before the year 1618 for it is of mine own raising and flowering first in my own garden

Although not achieving the sensationalism of tulips , daffodils and narcissi have been much celebrated in art and literature ( see The Arts ) . The largest demand for narcissi bulbs were large trumpet daffodils , *N. poeticus* and *N. bulbocodium* , and Istanbul became important in the shipping of bulbs to western Europe . By the early baroque period both tulips and narcissi were an important component of the spring garden . By 1739 a Dutch nursery catalogue listed 50 different varieties . A catalog of a Dutch nursery from 1739 already counted 50 varieties . In 1757 Hill gave an account of the history and cultivation of the daffodil in his edited version of the works of Thomas Hale , writing " The garden does not afford , in its Kind , a prettier plant than this ; nor do we know one that has been so early , or so honorably mention 'd by all Kinds of Writers " ( see illustration ) . Interest grew further when varieties that could be grown indoors became available , primarily the bunch flowered ( multiple flower heads ) *N. tazetta* ( *Polyanthus Narcissus* ) . However interest varied by country . Maddock ( 1792 ) does not include narcissi in his list of the eight most important cultivated flowering plants in England , whereas in the Netherlands van Kampen ( 1760 ) stated that *N. tazetta* ( *Narcisse à bouquet* ) is the fifth most important ? " *Le Narcisse à bouquet est la premiere fleur , après les Jacinthes , les Tulipes les Renoncules , et les Anemones , ( dont nous avons déjà parlé , ) qui merite nôtre attention* " . Similarly Philip Miller , in his *Gardeners Dictionary* ( 1731 ? 1768 ) refers to cultivation in Holland , Flanders and France , but not England , because it was too difficult , a similar observation was made by Sir James Justice at this time . However , for most species of *Narcissus* Lauremberg 's dictum *Magna cura non indigent Narcissi* was much cited .

Narcissi became an important horticultural crop in Western Europe in the latter part of the nineteenth century , beginning in England between 1835 and 1855 and the end of the century in the Netherlands . By the beginning of the twentieth century 50 million bulbs of *N. Tazetta* ' Paperwhite ' were being exported annually from the Netherlands to the United States . With the production of triploids such as ' Golden Spur ' , in the late nineteenth century , and in the beginning of the twentieth century , tetraploids like ' King Alfred ' ( 1899 ) , the industry was well established , with trumpet daffodils dominating the market . The Royal Horticultural Society has been an important factor in promoting narcissi , holding the first Daffodil Conference in 1884 , while the Daffodil Society

, the first organisation dedicated to the cultivation of narcissi was founded in Birmingham in 1898 . Other countries followed and the American Daffodil Society which was founded in 1954 publishes The Daffodil Journal quarterly , a leading trade publication .

Narcissi are now popular as ornamental plants for gardens , parks and as cut flowers , providing colour from the end of winter to the beginning of summer in temperate regions . They are one of the most popular spring flowers and one of the major ornamental spring flowering bulb crops , being produced both for their bulbs and cut flowers , though cultivation of private and public spaces is greater than the area of commercial production . Over a century of breeding has resulted in thousands of varieties and cultivars being available from both general and specialist suppliers . They are normally sold as dry bulbs to be planted in late summer and autumn . They are one of the most economically important ornamental plants . Plant breeders have developed some daffodils with double , triple , or ambiguously multiple rows and layers of segments . Many of the breeding programs have concentrated on the corona ( trumpet or cup ) , in terms of its length , shape , and colour , and the surrounding perianth or even as in varieties derived from *N. poeticus* a very reduced form .

== Narcissi as garden plants ==

While some wild narcissi are specific in terms of their ecological requirements , most garden varieties are relatively tolerant of soil conditions , however very wet soils and clay soils may benefit from the addition of sand to improve drainage . The optimum soil is a neutral to slightly acid pH of 6 @. @ 5 ? 7 @. @ 0 .

Bulbs offered for sale are referred to as either ' round ' or ' double nose ' . Round bulbs are circular in cross section and produce a single flower stem , while double nose bulbs have more than one bulb stem attached at the base and produce two or more flower stems , but bulbs with more than two stems are unusual . Planted narcissi bulbs produce daughter bulbs in the axil of the bulb scales , leading to the dying off of the exterior scales . To prevent planted bulbs forming more and more small bulbs , they can be dug up every 5 ? 7 years , and the daughters separated and replanted separately , provided that a piece of the basal plate , where the rootlets are formed , is preserved . For daffodils to flower at the end of the winter or early spring , bulbs are planted in autumn ( September ? November ) . This plant does well in ordinary soil but flourishes best in rich soil . Daffodils like the sun but also accepts partial shade exposure .

Narcissi are well suited for planting under small thickets of trees , where they can be grouped as 6 ? 12 bulbs . They also grow well in perennial borders , especially in association with day lilies which begin to form their leaves as the narcissi flowers are fading . A number of wild species and hybrids such as ' Dutch Master ' , ' Golden Harvest ' , ' Carlton ' , ' Kings Court ' and ' Yellow Sun ' naturalise well in lawns , but it is important not to mow the lawn till the leaves start to fade , since they are essential for nourishing the bulb for the next flowering season . Blue Scilla and Muscari which also naturalise well in lawns and flower at the same time as narcissus , make an attractive contrast to the yellow flowers of the latter . Unlike Tulips , narcissi bulbs are not attractive to rodents and are sometimes planted near tree roots in orchards to protect them .

When flower heads have died , removing ( deadheading ) them will allow more energy to build up the bulbs and strengthen the following years ' display .

== Propagation ==

The commonest form of commercial propagation is by twin @-@ scaling , in which the bulbs are cut into many small pieces but with two scales still connected by a small fragment of the basal plate . The fragments are disinfected and placed on nutrient media . Some 25 ? 35 new plants can be produced from a single bulb after four years . Micropropagation methods are not used for commercial production but is used for establishing commercial stock .

== Breeding ==

For commercial use , varieties with a minimum stem length of 30 cm are sought , making them ideal for cut flowers . Florists require blooms that only open when they reach the retail outlet . For garden plants the objectives are to continually expand the colour palette and to produce hardy forms , and there is a particular demand for miniature varieties . The cultivars so produced tend to be larger and more robust than the wild types . The main species used in breeding are *N. bulbocodium* , *N. cyclamineus* , *N. jonquilla* , *N. poeticus* , *N. pseudonarcissus* , *N. serotinus* and *N. tazetta* .

*N. pseudonarcissus* gave rise to trumpet cultivars with coloured tepals and corona , while its subspecies *N. pseudonarcissus* subsp. *bicolor* was used for white tepaled varieties . To produce large cupped varieties , *N. pseudonarcissus* was crossed with *N. poeticus* , and to produce small cupped varieties back crossed with *N. poeticus* . Multiheaded varieties , often called ' Poetaz ' are mainly hybrids of *N. poeticus* and *N. tazetta* .

#### == = Classification = = =

For horticultural purposes , all *Narcissus* cultivars are split into 13 divisions as first described by Kington ( 1998 ) , for the Royal Horticultural Society ( RHS ) , based partly upon flower form ( shape and length of corona ) , number of flowers per stem , flowering period and partly upon genetic background . The classification is a useful tool for planning planting . Most commercially available narcissi come from Divisions 1 ( Trumpet ) , 2 ( Large cupped ) and 8 ( Tazetta ) . Division 13 which includes the wild daffodil is the exception to this scheme .

Growers register new daffodil cultivars by name and color with the Royal Horticultural Society , which is the international registration authority for the genus . Their International Daffodil Register is regularly updated with supplements available online and is searchable . The most recent supplement ( 2014 ) is the sixth ( the fifth was published in 2012 ) . More than 27 @, @ 000 names were registered as of 2008 , and the number has continued to grow . Registered daffodils are given a division number and colour code such as 5 W @-@ W ( ' Thalia ' ) . In horticultural usage it is common to also find an unofficial Division 14 : Miniatures , which although drawn from the other 13 divisions , have their miniature size in common . Over 140 varieties have gained the Royal Horticultural Society 's Award of Garden Merit ( See List of Award of Garden Merit narcissus ) .

#### == = = Colour code = = = =

Daffodil breeding has introduced a wide range of colours , in both the outer perianth tepal segment and the inner corona . In the registry , daffodils are coded by the colours of each of these two parts . Thus ' Geranium ' , Tazetta ( Division 8 ) as illustrated here with a white outer perianth and orange corona is classified as 8 W @-@ O.

#### == = Toxicity = =

#### == = Pharmacology = = =

All *Narcissus* species contain the alkaloid poison lycorine , mostly in the bulb but also in the leaves . Members of the monocot subfamily Amaryllidoideae present a unique type of alkaloids , the norbelladine alkaloids , which are 4 @-@ methylcatechol derivatives combined with tyrosine . They are responsible for the poisonous properties of a number of the species . Over 200 different chemical structures of these compounds are known , of which 79 or more are known from *Narcissus* alone .

The toxic effects of ingesting *Narcissus* products for both man and animals ( such as cattle , goats , pigs and cats ) have long been recognised and they have been used in suicide attempts . Ingestion of *N. pseudonarcissus* or *N. jonquilla* is followed by salivation , acute abdominal pains , nausea , vomiting , and diarrhea , then neurological and cardiac events , including trembling , convulsions ,

and paralysis . Death may result if large quantities are consumed .

The toxicity of *Narcissus* varies with species , *N. poeticus* being more toxic than *N. pseudonarcissus* , for instance . The distribution of toxins within the plant also varies , for instance there is a five times higher concentration of alkaloid in the stem of *N. papyraceus* than in the bulb , making it dangerous to herbivores more likely to consume the stem than the bulb , and is part of the plant 's defence mechanisms . The distribution of alkaloids within tissues may also reflect defence against parasites . The bulbs can also be toxic to other nearby plants , including roses , rice , and cabbages , inhibiting growth . For instance placing cut flowers in a vase alongside other flowers shortens the life of the latter .

### = = = Poisoning = = =

Many cases of poisoning or death have occurred when narcissi bulbs have been mistaken for leeks or onions and cooked and eaten . Recovery is usually complete in a few hours without any specific intervention . In more severe cases involving ingestion of large quantities of bulbs activated charcoal , salts , and laxatives may be required , and for severe symptoms intravenous atropine and emetics or stomach pumping may be indicated . However , ingestion of large quantities accidentally is unusual because of a strong unpleasant taste . When narcissi were compared with a number of other plants not normally consumed by animals , narcissi were the most repellant , specifically *N. pseudonarcissus* . Consequently , narcissus alkaloids have been used as repellents and may also discourage fungi , molds , and bacteria .

On 1 May 2009 a number of schoolchildren fell ill at Gorseland Primary School in Martlesham Heath , Suffolk , England , after a daffodil bulb was added to soup during a cookery class .

### = = = Topical effects = = =

One of the most common dermatitis problems for flower pickers , packers , florists and gardeners , " daffodil itch " , involves dryness , fissures , scaling , and erythema in the hands , often accompanied by subungual hyperkeratosis ( thickening of the skin beneath the nails ) . It is blamed on exposure to calcium oxalate , chelidonic acid or alkaloids such as lycorine in the sap , either due to a direct irritant effect or an allergic reaction . It has long been recognised that some cultivars provoke dermatitis more readily than others . *N. pseudonarcissus* and the cultivars ' Actaea ' , ' Camparelle ' , ' Gloriosa ' , ' Grande Monarque ' , ' Ornatus ' , ' Princeps ' and ' Scilly White ' are known to do so .

If bulb extracts come into contact with wounds , both central nervous system and cardiac symptoms may result . The scent can also cause toxic reactions such as headaches and vomiting from *N. bulbocodium* .

### = = Uses = =

### = = = Traditional medicine = = =

Despite the lethal potential of *Narcissus* alkaloids , they have been used for centuries as traditional medicines for a variety of complaints , including cancer . Plants thought to be *N. poeticus* and *N. tazetta* are described in the Bible in the treatment for what is thought to be cancer . In the Classical Greek world Hippocrates ( ca . B.C. 460 ? 370 ) recommended a pessary prepared from narcissus oil for uterine tumors , a practice continued by Pedanius Dioscorides ( ca . A.D. 40 ? 90 ) and Soranus of Ephesus ( A.D. 98 ? 138 ) in the first and second centuries A.D. , while the Roman Pliny the Elder ( A.D. 23 ? 79 ) , advocated topical use . The bulbs of *N. poeticus* contain the antineoplastic agent narciclasine . This usage is also found in later Arabian , North African , Central American and Chinese medicine during the Middle Ages . In China *N. tazetta* var. *chinensis* was grown as an ornamental plant but the bulbs were applied topically to tumors in traditional folk medicine . These bulbs contain pretazettine , an active antitumor compound .

Narcissus products have received a variety of other uses . The Roman physician Aulus Cornelius Celsus listed narcissus root in De Medicina among medical herbs , described as emollient , erodent , and " powerful to disperse whatever has collected in any part of the body " . *N. tazetta* bulbs were used in Turkey as a remedy for abscesses in the belief they were antiphlogistic and analgesic . Other uses include the application to wounds , strains , painful joints and various local ailments as an ointment called ? *Narcissimum* ? . Powdered flowers have also been used medically , as an emetic , a decongestant and for the relief of dysentery , in the form of a syrup or infusion . The French used the flowers as an antispasmodic , the Arabs the oil for baldness and also an aphrodisiac . In the eighteenth century the Irish herbal of John K ? Eogh recommended pounding the roots in honey for use on burns , bruises , dislocations and freckles , and for drawing out thorns and splinters . *N. tazetta* bulbs have also been used for contraception , while the flowers have been recommended for hysteria and epilepsy . A homeopathic medicine made from bulbs was prescribed for bronchitis and whooping cough . In the traditional Japanese medicine of kampo , wounds were treated with narcissus root and wheat flour paste ; the plant , however , does not appear in the modern kampo herb list .

There is also a long history of the use of Narcissus as a stimulant and to induce trance like states and hallucinations . Sophocles referred to the narcissus as the ? Chaplet of the infernal Gods ? , a statement frequently wrongly attributed to Socrates ( see Antiquity ) .

#### = = = Biological properties = = =

Extracts of Narcissus have demonstrated a number of potentially useful biological properties including antiviral , prophage induction , antibacterial , antifungal , antimalarial , insecticidal , cytotoxic , antitumor , antimutagenic , antiplatelet , hypotensive , emetic , acetylcholine esterase inhibitory , antifertility , antinociceptive , chronotropic , pheromone , plant growth inhibitor , and allelopathic . An ethanol extract of Narcissus bulbs was found effective in one mouse model of nociception , para @-@ benzoquinone induced abdominal constriction , but not in another , the hot plate test . Most of these properties are due to alkaloids , but some are also due to mannosa @-@ binding lectins . The most @-@ studied alkaloids in this group are galantamine ( galanthamine ) , lycorine , narciclasine , and pretazettine .

It is likely that the traditional use of narcissi for the treatment of cancer was due to the presence of isocarbostryl constituents such as narciclasine , pancratistatin and their congeners . *N. poeticus* contains about 0.12g of narciclasine per kg of fresh bulbs .

Acetylcholine esterase inhibition has attracted the most interest as a possible therapeutic intervention , with activity varying by a thousandfold between species , and the greatest activity seen in those that contain galantamine or epinorgalanthamine .

The rodent repellent properties of Narcissus alkaloids have been utilised in horticulture to protect more vulnerable bulbs .

#### = = = Therapeutics = = =

Of all the alkaloids , only galantamine has made it to therapeutic use in man , as the drug galantamine for Alzheimer 's disease . Galantamine is an acetylcholine esterase inhibitor which crosses the blood brain barrier and is active within the central nervous system . Daffodils are grown commercially near Brecon in Powys , Wales , to produce galantamine , a drug used to combat Alzheimer 's disease .

#### = = = Commercial uses = = =

Throughout history the scent of narcissi has been an important ingredient of perfumes , a quality that comes from essential oils rather than alkaloids . Narcissi are also an important horticultural crop , and source of cut flowers ( floriculture ) .

The Netherlands , which is the most important source of flower bulbs worldwide is also a major



centre of narcissus production . Of 16 @, @ 700 hectares ( ha ) under cultivation for flower bulbs , narcissi account for about 1 @, @ 800 hectares . In the 1990s narcissus bulb production was at 260 million , sixth in size after tulips , gladioli , irises , crocuses and lilies and in 2012 it was ranked third . About two thirds of the area under cultivation is dedicated to about 20 of the most popular varieties . In the 2009 / 2010 season 470 cultivars were produced on 1578 ha . By far the largest area cultivated is for the miniature ' Tête @-@ à @-@ Tête ' , followed at some distance by ' Carlton ' . The largest production cultivars are shown in Table II ;

' Carlton ' and ' Ice Follies ' ( Division 2 : Large cup ) have a long history of cultivation , together with ' Dutch Master ' and ' Golden Harvest ' ( 1 : yellow ) . ' Carlton ' and ' Golden Harvest ' were introduced in 1927 , and ' Ice Follies ' in 1953 . ' Carlton ' , with over 9000 million bulbs ( 350 000 tons ) , is one of the larger individual plants produced in the world . The other major areas of production are the United States , Israel which exported 25 million N. tazetta cultivar bulbs in 2003 , and the United Kingdom .

In the United Kingdom a total of 4100 ha were planted with bulbs , of which 3800 ha were Narcissi , the UK 's most important bulb crop , much of which is for export , making this the largest global production centre , about half of the total production area . While some of the production is for forcing , most is for dry bulb production . Bulb production and forcing occurs in the East , while production in the south west is mainly for outdoor flower production . The farm gate value was estimated at £ 10m in 2007 .

Production of both bulbs and cut flowers takes place in open fields in beds or ridges , often in the same field , allowing adaptation to changing market conditions . Narcissi grow best in mild maritime climates . Compared to the United Kingdom , the harsher winters in the Netherlands require covering the fields with straw for protection . Areas with higher rainfall and temperatures are more susceptible to diseases that attack the crops. production is based on a 1 ( UK ) or 2 ( Netherlands ) year cycle . Optimal soil pH is 6 @. @ 0 ? 7 @. @ 5 . Prior to planting disinfection by hot water takes place , such as immersion at 44 @. @ 4 ° C for three hours .

Bulbs are harvested for market in the summer , sorted , stored for 2 ? 3 weeks , and then further disinfected by a hot ( 43 @. @ 5 ° C ) bath . This eliminates infestations by narcissus fly and nematodes . The bulbs are then dried at a high temperature , and then stored at 15 @. @ 5 ° C. The initiation of new flower development in the bulb takes place in late spring before the bulbs are lifted , and is completed by mid summer while the bulbs are in storage . The optimal temperature for initiation is 20 ° C followed by cooling to 13 ° C.

Traditionally , sales took place in the daffodil fields prior to harvesting the bulbs , but today sales are handled by Marketing Boards although still before harvesting . In the Netherlands there are special exhibition gardens for major buyers to view flowers and order bulbs , some larger ones may have more than a thousand narcissus varieties on display . While individuals can visit these gardens they cannot buy bulbs at retail , which are only available at wholesale , usually at a minimum of several hundredweight . The most famous display is at Keukenhof , although only about 100 narcissus varieties are on display there .

== == Forcing == ==

There is also a market for forced blooms , both as cut flowers and potted flowers through the winter from Christmas to Easter , the long season requiring special preparation by growers .

#### Cut flowers

For cut flowers , bulbs larger than 12 cm in size are preferred . To bloom in December , bulbs are harvested in June to July , dried , stored for four days at 34 ° C , two weeks at 30 and two weeks at 17 ? 20 ° C and then placed in cold storage for precooling at 9 degrees for about 15 ? 16 weeks . The bulbs are then planted in light compost in crates in a greenhouse for forcing at 13 ° C ? 15 ° C and the blooms appear in 19 ? 30 days .

#### Potted flowers

For potted flowers a lower temperature is used for precooling ( 5 ° C for 15 weeks ) , followed by 16 ° C ? 18 ° C in a greenhouse . For later blooming ( mid- and late @-@ forcing ) , bulbs are

harvested in July to August and the higher temperatures are omitted , being stored a 17 ? 20 ° C after harvesting and placed in cold storage at 9 ° C in September for 17 ? 18 ( cut flowers ) or 14 ? 16 ( potted flowers ) weeks . The bulbs can then be planted in cold frames , and then forced in a greenhouse according to requirements .

#### Narcissus tazetta

N. tazetta and its cultivars are an exception to this rule , requiring no cold period . Often harvested in October , bulbs are lifted in May and dried and heated to 30 ° C for three weeks , then stored at 25 ° C for 12 weeks and planted . Flowering can be delayed by storing at 5 ° C ? 10 ° C.

= = Culture = =

= = = Symbols = = =

The daffodil is the national flower of Wales , associated with Saint David 's Day ( March 1 ) . The narcissus is also a national flower symbolising the new year or Newroz in the Iranian culture .

In the West the narcissus is perceived as a symbol of vanity , in the East as a symbol of wealth and good fortune ( see Eastern cultures ) , while in Persian literature , the narcissus is a symbol of beautiful eyes .

In western countries the daffodil is also associated with spring festivals such as Lent and its successor Easter . In Germany the wild narcissus , N. pseudonarcissus , is known as the Osterglocke or " Easter bell . " In the United Kingdom the daffodil is sometimes referred to as the Lenten lily .

Although prized as an ornamental flower , some people consider narcissi unlucky , because they hang their heads implying misfortune . White narcissi are especially associated with death , such as N triandrus ' Thalia ' , and have been called grave flowers . In Ancient Greece narcissi were planted near tombs and Robert Herrick , describes them as portents of death , an association which also appears in the myth of Persephone and the underworld ( see The Arts , below ) .

= = = The Arts = = =

= = = = Antiquity = = = =

The decorative use of narcissi dates as far back as ancient Egyptian tombs , and frescoes at Pompeii . They are mentioned in the King James Version of the Bible as the Rose of Sharon and make frequent appearances in classical literature .

= = = = = Greek culture = = = = =

The narcissus appears in two Graeco @-@ Roman myths , that of the youth Narcissus who was turned into the flower of that name , and of the Goddess Persephone snatched into the Underworld by the god Hades while picking the flowers . The narcissus is considered sacred to both Hades and Persephone , and to grow along the banks of the river Styx in the underworld .

The Greek poet Stasinos mentioned them in the Cypria amongst the flowers of Cyprus . The legend of Persephone comes to us mainly in the seventh century BC Homeric Hymn To Demeter , where the author describes the narcissus , and its role as a lure to trap the young Persephone . The flower , she recounts to her mother was the last flower she reached for before being seized .

Other Greek authors making reference to the narcissus include Sophocles and Plutarch . Sophocles , in Oedipus at Colonus utilises narcissus in a symbolic manner , implying fertility , allying it with the cults of Demeter and her daughter Kore ( Persephone ) , and by extension , a symbol of death . Jebb comments that it is the flower of imminent death with its fragrance being narcotic , emphasised by its pale white colour . Just as Persephone reaching for the flower heralded her doom

, the youth Narcissus gazing at his own reflection portended his own death . Plutarch refers to this in his Symposiacs as numbing the nerves causing a heaviness in the limbs . He refers to Sophocles ' " crown of the great Goddesses " , which is the source of the English phrase " Chaplet of the infernal Gods " incorrectly attributed to Socrates .

A passage by Moschus , describes fragrant narcissi . Homer in his Odyssey described the underworld as having Elysian meadows carpeted with flowers , thought to be narcissus , as described by Theophrastus . A similar account is provided by Lucian describing the flowers in the underworld . The myth of the youth Narcissus is also taken up by Pausanias . He believed that the myth of Persephone long antedated that of Narcissus , and hence discounts the idea the flower was named after the youth .

===== Roman culture =====

Virgil , the first known Roman writer to refer to the narcissus , does so in several places , for instance twice in the Georgics . Virgil refers to the cup shaped corona of the narcissus flower , allegedly containing the tears of the self @-@ loving youth Narcissus . Milton makes a similar analogy " And Daffodillies fill their Cups with Tears " . Virgil also mentions narcissi three times in the Eclogues .

The poet Ovid also dealt with the mythology of the narcissus . In his Metamorphoses , he recounts the story of the youth Narcissus who , after his death , is turned into the flower , and it is also mentioned in Book 5 of his poem Fasti . This theme of metamorphosis was broader than just Narcissus ; for instance see crocus , laurel and hyacinth .

===== Western culture =====

Although there is no clear evidence that the flower 's name derives directly from the Greek myth , this link between the flower and the myth became firmly part of western culture . The narcissus or daffodil is the most loved of all English plants , and appears frequently in English literature . Many English writers have referred to the cultural and symbolic importance of Narcissus ) . No flower has received more poetic description except the rose and the lily , with poems by authors from John Gower , Shakespeare , Milton ( see Roman culture , above ) , Wordsworth , Shelley and Keats . Frequently the poems deal with self @-@ love derived from Ovid 's account . Gower 's reference to the yellow flower of the legend has been assumed to be the daffodil or Narcissus , though as with all references in the older literature to the flower that sprang from the youth 's death , there is room for some debate as to the exact species of flower indicated , some preferring Crocus . Spenser announces the coming of the Daffodil in Aprill of his Shepherdes Calender ( 1579 ) .

Shakespeare , who frequently uses flower imagery , refers to daffodils twice in The Winter 's Tale and also The Two Noble Kinsmen . Robert Herrick alludes to their association with death in a number of poems . Amongst the English romantic movement writers none is better known than William Wordsworth 's short 1804 poem I Wandered Lonely as a Cloud which has become linked in the popular mind with the daffodils that form its main image . Wordsworth also included the daffodil in other poems . Yet the description given of daffodils by his sister , Dorothy is just as poetic , if not more so , just that her poetry was prose and appears almost an unconscious imitation of the first section of the Homeric Hymn to Demeter ( see Greek culture , above ) . Amongst their contemporaries , Keats refers to daffodils amongst those things capable of bringing ' joy for ever ' .

More recently A. E. Housman , using one of the daffodil 's more symbolic names ( see Symbols ) , wrote The Lent Lily in A Shropshire Lad , describing the traditional Easter death of the daffodil .

In Black Narcissus , Rumer Godden describes the disorientation of English nuns in the Indian Himalayas , and gives the plant name an unexpected twist , alluding both to narcissism and the effect of the perfume Narcisse Noir ( Caron ) on others . The novel was later adapted into the 1947 British film of the same name . The narcissus also appears in German literature such as that of Paul Gerhardt .

In the visual arts , narcissi are depicted in three different contexts , mythological ( Narcissus ,

Persephone ) , floral art , or landscapes . The Narcissus story has been popular with painters and the youth is frequently depicted with flowers to indicate this association . The Persephone theme is also typified by Waterhouse in his Narcissus , the floral motif by van Scorel and the landscape by Van Gogh 's Undergrowth .

Narcissi first started to appear in western art in the late middle ages , in panel paintings , particularly those depicting crucifixion . For instance that of the Westfälischer Meister in Köln in the Wallraf @-@ Richartz @-@ Museum , Cologne , where daffodils symbolise not only death but also hope in the resurrection , because they are perennial and bloom at Easter .

= = = = Eastern cultures = = = =

In Chinese culture Narcissus tazetta subsp. chinensis ( Chinese sacred lilies ) , which can be grown indoors , is widely used as an ornamental plant . It was probably introduced to China by Arab traders travelling the Silk Road prior to the Song Dynasty for medicinal use . Spring @-@ flowering , they became associated with Chinese New Year , signifying good fortune , prosperity and good luck and there are many legends in Chinese culture associated with Narcissus . In contrast to the West , narcissi have not played a significant part in Chinese Garden art , however , Zhao Mengjian in the Southern Song Dynasty was noted for his portrayal of narcissi . Narcissus bulb carving and cultivation has become an art akin to Japanese bonsai The Japanese novel Narcissu contains many references to the narcissus , where the main characters set out for the famed narcissus fields on Awaji Island .

= = = = Islamic culture = = = =

Narcissi are one of the most popular garden plants in Islamic culture . Prior to the Arab conquest of Persia , the Persian ruler Khosrau I is said to have not been able to tolerate them at feasts because they reminded him of eyes , an association that persists to this day , as described by the poet Ghalib . The eye imagery is also found in a number of poems by Abu Nuwas . Another poet who refers to narcissi , is Rumi . Even the prophet Mohammed is said to have praised the narcissus .

= = = Popular culture = = =

The word " daffodil " has been used widely in popular culture , from Dutch cars ( DAF Daffodil ) to Swedish rock bands ( The Daffodils ) to slurs against homosexuals and cross @-@ dressers ( as in the film J. Edgar , when Hoover 's mother explains why real @-@ life cross @-@ dresser Barton Pinkus was called " Daffy " ( short for " Daffodil " and the equivalent of a pansy ) , and admonishes , " I 'd rather have a dead son than a daffodil for a son " .

= = = Festivals = = =

In some areas where narcissi are prevalent , their blooming in spring is celebrated in festivals . For instance , the slopes around Montreux , Switzerland and its associated riviera come alive with blooms each May ( May Snow ) at the annual Narcissi Festival . Festivals are also held in many other countries .

= = = Cancer = = =

Various cancer charities around the world , such as the American Cancer Society , and Marie Curie in the UK use the daffodil as a fundraising symbol on " Daffodil Days " .

= = Wikimedia links = =

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