The name of genus Primula comes from the Latin prima – the first. Linnaeus named this genus after the species *P. vulgaris* which often flowered in the midst of winter. Originally included in Linnaeus’ collective species *Primula elatior* L. (Linn. Syst., Ed. 1. 1735), *P. vulgaris* was later separated by Hudson. Still, later authors separated several species into new genera, but these were not accepted generally, and we consider them now as synonyms. Among these are *Aretia*, Link Handb., ii. 411; 1829, *Auganthus*, Link 1.c. 414; 1829, *Euetrochis*, Rafin., Fl. Tellur. ii. 76; 1836, *Oscaria*, Lilja in Lindbl. Bot. Notiser, 1839/39, *Aleuritia*, Spach, Hist. veg. Phal. ix. 360, 1840, *Primulidium*, Spach, 1c. i. x. 354, 1840, *Cankrienia*, De Brie in Miq. Pl. Jungh. 86; 1851, *Kablikia*, Opiz, Seznam, 55, 1852.

The system of genus *Primula* L. is now elaborated in very fine detail, except for those species inhabiting territory of the Chinese People’s Republic, many of which are described on the basis of sometimes incomplete herbarized matter. And yet, it is this very large area which is considered the center of evolution of the whole genus.

The first monograph on the primulae was published by Lehmann in 1817. This work contains as yet no distinct classification. Two later works, “Botanicon Gallicum” of Duby and “Prodromus” of De Candolle, divided the genus into five sections. Schott’s slightly later classification showed two subgenera and six sections.

After the first collections of French missionaries Delavay, David and Soulie (elaborated botanically by Franchet) in western China, a great development of
systematic work on the genus Primula began. The first modern system was published by Pax in 1905 (Das Pflanzenreich 22 Heft, IV, 237, Leipzig, 1905). Pax did not arrange new species too happily. His system, without change but in a somewhat simplified form, was taken over by W. W. Smith et Fletcher (Trans. Bot. Soc. Edin. XXIII, 2, 1941-122) who divided the genus into 30 sections. This system is now in general use, although it has many insufficiencies, especially from the phylogenetic point of view. The Smith-Fletcher outline made room for a large number of species, collected in the Sino-Himalayan region by such legendary collectors as Rock, Farrer, Forrest, Meyer, Mandel-Mazzetti, Schneider and Limpricht, and later by Ward, Smith, Ludlow, Sherriff, Hara and others.

Recently the Norwegian Wendelbo published (Acta Universitatis Bergen-sis, 1961, No. 11, 33-49) a new system of Primula classification, based on a synthesis of the systems of Pax and his predecessors, as well as on those of Balfour, and Smith/Fletcher. The system divides genus Primula into 8 subgenera, which are further divided into sections as follows:

I. subgen. Sphondylia/Duby/Ruprecht: sections 1. Sphondylia
V. subgenus Carolinella/Hems/w/Wendelbo: section 1. Carolinella

Wendelbo's system is more nearly suitable for practical use. Still, it is not yet official, and the older synonyms of subgenera and sections appear in various parts of this book. As is proper, I have tried in my nomenclature to adhere to the rule of priority. For certain obscure species I have adhered to the critical Flora of their home regions. In other cases my own experience from collecting and observation of the plants in the wild - mainly in the mountains of Europe, the Caucasus, Siberia and Central Asia - has seen some remaining questions opened, especially in the case of Sections Primula, Crystallophlomis and Aleuritia, as well as others.

Geographically the primroses are as widespread as the Androsaces. Most species have their homes in Eurasia and North America; a few species are inhabitants of North and Northeast Africa and South America. The section inhabiting the largest area and the second richest in number of species is Aleuritia (formerly Farinosa). Some species which belong in this section inhabit the whole of Europe and Asia; others are circumpolar in the Arctic regions of Eurasia and North America, and a very few species have their home in the far south of South America. The third largest section is Crystallophlomis (formerly Nivalis) which inhabits nearly all Asia and arctic North America. Another large section is Craibia (formerly Petiolata), species of which grow only in the Sino-Himalayan region. Species of section Auriculas-trum (formerly Auricula) can be found only in the mountains of Europe. Species of subgenus Sphondylia (formerly Petiolaris) are mainly on the Arctic peninsula, in the region of Iran, and in several localities of northeastern Africa. By far the largest concentration of primula species live in the Himalayas, southeastern Tibet, the west Chinese Alps (Yunnan, Szechwan) and adjacent regions of Burma. From the alpine gardener's point of view the genus Primula is one of the most variable. The separate species inhabit in the wild perhaps all imaginable types of terrain except the deep water. Many species are inhabitants of rocks, but we must distinguish dry rocks exposed to sun, where grow forms of the European P. auricula, from dry but shaded rocks where is to be found the Iranian P. gaubean, from moist rocks, which shelter many species. Still other species inhabit screes and stony field. Many species grow on meadows high in the mountains or on lower slopes, such as the members of sections Crystallophlomis, Parryi, Auriculastrum, Primula, Craibia, Aleuritia and others. Many species live in boggy places, on brookbanks and in woods dry or moist, light or shaded, very often on rotting trunks of decinduous trees or on sands of the seacoast. At the present time there are about 500 species of genus Primula known, and we believe that it is possible to choose suitable species for any garden. It is important, however to respect their individual requirements, as they are often so different.

Under suitable conditions in gardens we can plant primulas in groups of species in "alpine meadows". We can place the moisture-loving species in close neighborhood to pools and brooks. But for the most part the species of primula will decorate our rock gardens. In the pages which follow the requirements of various species are described in detail, as well as methods of propagating them, in accordance with my own experience.

Sowing Primula Seed

In general, we should keep to this rule: sow seed as soon as possible after ripening. Pulpos seeds are of very short viability and must be sown immediately after ripening - or stratified. The dry-loving species, such as forms of P. auricula, retain their seed viability for years, but the seeds of subgenus Craibia lose their viability almost as soon as their pulpos perisperm becomes dry. The method of sowing depends on requirements of the species. The few light lovers can without danger be placed in a sunny spot, protected only against the hottest sun at noon. But the majority of primulas require partial shade for germination, and the woodlanders need full shade - otherwise the tiny seedlings remain undeveloped or grow dwarfed. It all depends on the individual conditions of each garden, on its soil, air, moisture, exposure, local precipitation, winds, etc.

Some primulas have very fine seeds and it is recommended that they be sown under glass. Some growers do not cover seeds in pots or pans at all. Our seeds of primula are in pans and flats, kept outdoors all year round, and we do not cover even those species with very small seeds, such as those of sections Muscarioides, Aleuritia, Solidanelloides and others. Seeds sown on the soil surface are covered by a thin
layer of fine gravel. This layer reliably protects the seeds, and even the smallest seedlings, against birds and the hot sun.

Pots or boxes with seedlings which are not pricked the first year, e.g., several species in section Solanelloides, Auriculastrum and others, can be placed in the fall on their side so that the plants lie horizontally. This method proved much better than placing the plants in a greenhouse or coldframe where there is always a possibility of damage by rodents. An additional advantage is that the vessels that lie on their side can be turned northward and shaded by branches of evergreens so that most of the winter the plants remain frozen and are not heaved by frost. The soil for seed is the same as for mature plants and will be mentioned in individual sections or with particularly sensitive species. Let me note here that experience with the described species were gained in a rock garden located at an altitude of 1,000 meters with southern exposure, average yearly precipitation of 1800 mm, and frequent dense fog. The slope was often lashed by strong westerly winds.

I tried to cultivate most of the species. For most of the plants I did not particularly try to improve the native heavy soil. Even a very heavy soil can keep the plants dry throughout the year; on the other hand, even a well-drained pit with light soil will remain moist most of the year. An appropriate combination of these two factors will yield a great variety of different sites which will allow us to grow side by side ecologically different varieties. In the description of individual species I will briefly characterize the natural habitat of each plant. It will be useful particularly for plants that are not yet in cultivation but which may appear in our rock gardens in the future. For the sake of brevity I have omitted the key for determining the sections and individual species. The descriptions are sufficiently detailed and I will call attention to specific differences when closely similar species occur.

At the end of the book will be found an index of names assembling alphabetically all those species the reader meets most frequently in the literature. The plants described in the sections which follow were either collected in nature (European, Caucasian, Siberian and Central Asiatic species) or gotten from friends in England, Scotland, the USSR, the USA and Japan. In some cases what I have described might be a hybrid instead of a true species.

I am indebted to many friends for help given to me about verification of data, valuable suggestions and plant material. My thanks go especially to: Mrs. Roxie F. Geyvan, Mr. A. Duguid, Mr. H. Esslemont, V. Pletsch, Dr. J. Kazbal, Dr. J. Sojak, Dr. Z. Selbert, Prof. Vinko Strgar and to my wife Jarmila, who with such care has drawn all the illustrations.

And now I would like to wish to all the readers and growers much joy and many successes, not only with Primroses, but with all the nice plants which make up the large empire of alpines.
P. edelbergii Swartz

P. floribunda Wall.

P. verticilata Forsk.

P. gaubeana Bornm.
*P. verticillata* Forsk. comes from the mountains of Arabia and northeast Africa. It forms rosettes of nearly membranaceous, thin (some pellucid) lanceolate to long ovate leaves with short petioles, which can reach up to 30cm. The stem is thick and covered with white farina.

*ssp. verticillata*: The stem is 10-40cm high, with 2-5 whorls each carrying 4-20 flowers. The corolla is sweet scented, yellow, with 15-20mm in diameter. A long corolla tube is characteristic.

*ssp. boveana/Decne/W.W. Smith et Forrest*, from the Sinai peninsula, is somewhat smaller in all aspects than the type plant and can be distinguished by its large ovate and lobate bracts with serrate margin. Flowers are small, up to 10mm in diameter and yellow.

*ssp. simensis/Hochst./W.W. Sm.* et Forrest has its home in the mountains of Abyssinia, where it grows at elev. 1800-3500m. It is a most robust subspecies, with flowering stems often reaching 40-70cm high. There are 2-8 whorls with 6-24 flowers each. The corolla is large, with limb to 30mm in diameter. The tube is up to 4cm long, the corolla lobes are only very slightly emarginate. This subspecies can be wintered outdoors in our climate, if we can keep them dry enough through the winter.

(to be continued)
Highlights of the 1985 Seed Conference

Joe Dupre
Anacortes, WA

Long-term seed storage means anything from keeping seed vigorous for next year’s planting to preserving endangered germplasm for future generations. The techniques for both short- and long-term storage are the same.

Seed storage is accomplished by putting seeds into a state of deep dormancy. The techniques are simple, but because seeds are living, respiring tissue, the process must be done correctly.

Proper storage conditions maintain high percent germination. Unless seeds have a post-harvest dormancy problem, their best germination percentage occurs right after harvest, and they go slowly downhill after that. Proper seed storage makes this decline in germination percentage very slow.

Proper storage conditions maintain seed vigor. Seed vigor is defined as the ability of seeds to germinate and grow very rapidly even in stress conditions. Low vigor seeds are still alive, but will produce good plants only when the germination conditions are favorable. They will germinate in a warm greenhouse, but not in the field. Seed vigor is obviously important, especially for seeds that will be planted in the cold soils of early spring. Unfortunately, seed vigor is difficult to measure, but we do know that vigor is lost more rapidly than the ability to germinate.

Long-term storage is easy and effective if it’s done right. It should begin with high quality seed, and this relies on good culture of the mother plant. The best quality seeds develop . . . by giving the plant the best cultural and environmental conditions that are economically feasible. It is important to maintain these conditions throughout the life cycle of the plant.

Maintaining soil fertility is particularly important. Soil fertility, especially nitrogen, tends to decrease throughout the life of the plant. If seeds are filling and maturing when nitrogen is low in the soil, they usually have lower protein content than they would if nitrogen was adequate. Low protein is associated with low seed vigor in some species.

Hydroponically-grown plants have a constant nitrogen supply throughout their life cycle. Our research at Utah State University involves growing wheat hydroponically. Wheat grown in our high nitrogen environment has 50% more seed protein than field-grown wheat (21% protein in hydroponics, 14% in the field). This spectacular increase in seed protein will not necessarily occur with all crops grown hydroponically, but the principle is clear: to maximize seed quality, don’t let plants run out of nutrients.

The fruits that set on the plant usually produce the highest quality seed. When possible, select these fruits for long-term storage.

Selection of good seed is important, but the real key to obtaining a long storage life is the storage environment itself. The best storage environment can be summarized in two words: cold and dry. A simple equation that shows the value of these two conditions was developed by Dr. Jim Harrington at the University of California, Davis (Harrington, 1963). Harrington found that seed storage life was doubled for each 1% decrease in seed moisture and doubled again for every 9 F decrease in temperature. This estimate applies for seeds between 5 and 14% moisture and for temperatures between 0 and 50 C (32 to 122 F). Temperatures below freezing improve storage life, but they don’t necessarily double the life for each 9 F decrease. The effects of moisture and temperature apply independently and the effects are additive, so this equation predicts a phenomenally long storage life for seeds kept cold and dry.

. . . From Harrington’s equation we predict that our onion seed would show the same decrease in vigor after 32 years as it did after one year on the shelf. This equation is supported by a great deal of actual seed storage data and is quite accurate in predicting seed longevity.

How can these cold, dry conditions be created? Temperature is easy to control and measure. The colder the better. Putting them in the freezer is better than in the refrigerator, and the refrigerator is better than on the shelf. Seed moisture is more difficult to measure, and to make matters worse, seeds can be overdried. If no special drying methods are used, seed moisture content depends on the type of seed and on the relative humidity of the air.

Seed removal from storage can be important. There is some evidence that if you hydrate seeds slowly, after drying them down to a very low moisture content, their vigor and their germination percentages are better. Unfortunately, there is no simple way for a home gardener to hydrate seeds slowly. If you have valuable old seeds that may be nearing the end of their life span, don’t plant them out in the field. Start them in a greenhouse. Even with low vigor, the seeds will still germinate, and the established plants can be later transplanted to the field.

*from SEED PHYSIOLOGY AND LONG-TERM STORAGE
Dr. Bruce Bugbee, Professor of Plant Physiology, Utah State University.

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Recovering Fertility in *Primula Kisoana*

Norman Deno  
State College, Pa.

Of the twenty-six sections in the genus *Primula*, the five best suited to conditions in Central Pennsylvania are *auricula*, *candelabra*, cortusoides, *denticulata*, and *vernales*. *Primula kisoana* belongs to one of these, the cortusoides or woodland primulas, and it belongs to the group in cortusoides that have basal or palmate veining in the leaves. Five circumstances brought *P. kisoana* to my attention. (1) It is confined to Southwestern Japan and has always been a rare species. Recent reports say that it is virtually extinct in the wild. (2) It grows particularly well here on north facing slopes in the high shade of tall oaks. (3) Although it propagates readily by stolons, individual clones are self sterile and seed is scarce. (4) In Roy Green’s “Asiatic *Primula*” he quotes Takeda as saying that *P. kisoana* is “one of the most beautiful, rare, and interesting of the Japanese primulas,” but Green adds that it does not set seed and may no longer be in cultivation. (5) It fitted well with my program of propagating endangered species.

The first step in establishing a breeding colony was to obtain as many clones as possible to build up a large gene pool and to establish hopefully good interfertility. An order from Japan brought a white and a lavender clone. Anita Kistler provided the lilac clone from her large colony. Linc Foster provided two additional clones. Finally, from several seed packets (all that could be obtained) two plants were raised. With this start the plants were hand pollinated exhaustively using my pin poking method. A small crop of seed was obtained and a first generation of ten plants were raised. Half were pin eyed and half thrum eyed. The surprising thing about this first generation was that the plants varied and several were more showy than the original clones. The clone commonly grown in the Philadelphia area is lilac in color, is only two inches high when in flower, has generally only three flowers per stem, and is somewhat shy blooming. Furthermore, the corolla lobes are narrow with parallel sides giving the flowers a thin look. One seedling had flowers as large (1.5 inches wide) and as full as any *P. sieboldii* and had nine flowers circularly arranged in the umbel. Another had two whorls with the lower with five flowers and the upper with three flowers. The former was rose pink and the latter more lilac. These plants compare favorably with the greenhouse *P. obconica* and *P. sinensis*.

The leaves are very wooly and remain in good condition until late in the fall.
This makes a better garden plant than *P. sieboldii* which loses its foliage in midsummer. The seed of *P. kisoana* matures later than most primula and is not ripe until mid September.

There has been a problem in germinating the seed. The first generation seed was kept outdoors all winter. It germinated in spring and grew faster and became bigger plants faster than any other primula in my experience. The second generation seed was abundant and looked large and full. However, alternating three months at 41 and 70 degrees F failed to germinate a single seed in four cycles. It is possible that longer cold periods, variable temperatures, or lower temperatures are needed to break dormancy. Extensive tests are underway to test these possibilities.

*Primula kisoana* has the potential to become one of the most popular of all primulas. It is also likely that breeding will generate a variety of colors and forms comparable to *P. sieboldii*.

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**Understanding pH**

Stephan Drennan  
Reprinted from House of Plants and Porch Gardens

Flocculation, ionization, buffering . . . what does it all mean?

Soil acidity is slightly mysterious. Most of us know that it has to do with the “sweetness” or “sourness” of a growing medium. And many plant lovers are aware that different plants prefer different soils. Some like it acid and some alkaline. But the why and how that lies behind all this talk of sweet and sour soil is unclear to many growers. Soil acidity and alkalinity is perplexing. It isn’t a matter of fertilizer or drainage. It’s a measurement of potential soil fertility. And, to make things worse, the measurement is recorded in numbers. So, when talking about soil, we come face to face with a numerical representation, called a pH, that is baffling. Numbers like 6.5 and 7.2 are bandied about even though most of us aren’t sure why they’re even worth knowing.

Well, a soil’s pH is as important as its porosity and drainage characteristics. The pH of a soil is more important than the fertilizer you give your plants. For, to put it simply, no matter how much or how often you fertilize, no matter how regularly and carefully you feed your plants, your time and money are spent well only if your soil’s pH is right for the plant you’re growing. If a soil is too sweet or too sour for your chosen specimen the plant’s roots never will be able to absorb sufficient nutrients from the soil, no matter how many you put there. Consequently, pH is the crucial soil factor that determines how accessible the nutrients in the soil are. That is, pH is like a key, insignificant until you realize it is necessary to unlock a huge door behind which great treasures lie.

**Water**

Water is special stuff that has a tremendous influence on soil. It changes a dry potting soil into a system of nutrients that can be absorbed by plants. Nutrients dissolve in water and plants absorb both at the same time. Water, clinging to soil particles, makes it possible for plants to take in the many materials they need to survive.

Water also stays in the soil for a long time. But as it does so, it becomes involved in a subtle chemical interaction with soil and the minerals it contains. In effect, there is only so much room on a particle of soil. That “room” is occupied by positively charged nutrient ions that stick to soil the way nails stick to a magnet. These nutrient ions are the stuff that plants absorb. The trouble is that hydrogen ions also stick to soil particles. And there is a lot of hydrogen in water. So, when water passes through soil, some of it ionizes, releasing hydrogen that clings to soil particles. Hydrogen and nutrient ions begin competing for space on soil particles. Inevitably, the hydrogen wins now and then, forcing minerals into the water that surrounds the soil particles themselves. Once in the water, the nutrients are washed away. The effect
is to deplete the number of nutrient ions on soil particles and so deplete the amount of minerals available to plants.

A soil that has been watered repeatedly has relatively few nutrients still clinging to its particles. Those particles are coated with hydrogen ions. And this condition is known as acidic. Whenever water percolates through soil, the ground becomes less and less fertile unless it is supplied with nutrients by the addition of either humus or fertilizer. If the condition becomes extreme enough, the soil won't support living plants because it has so few nutrients to offer.

If very wet areas produce acid soil, it is logical to assume that dry areas produce alkaline (sweet) soil. And this is just the case. Nutrients in the soil in a dry climate tend to be brought to the surface by evaporating ground water. As water moves up through the soil, hydrogen ions are lost to the water and nutrients cling to the soil particles. In extreme cases this can result in "alkali flats" in desert areas where a crust of mineral salts develops at the surface of the soil. These salts choke plant life as well as do very acid conditions. If very wet areas produce acid soil, all you have to do is look at the plants growing in it. If they're healthy, you can assume they're getting everything they need and that their soil is just right. But if leaves on your plants are turning yellow, or if growth is stunted even though you've fertilized, then you may have unbalanced soil. Once you've ruled out diseases, pests and cultural factors like light and water, be suspicious of your soil.

### Chemical Seesaw

If you mix some soil with distilled water and dip specially treated paper in the mixture, the paper will change color. You get your pH number by comparing the wetted strip with a chart of different colors, each representing a specific pH. Another way to get a direct reading of soil pH is with an electronic pH meter. Insert the meter's test probe into a wet soil sample and the degree of acidity or alkalinity is indicated on a scale. When you adjust the pH of a soil mix, you alter the balance of soil nutrients, varying their availability to plant roots. Generally speaking, the essential nutrients are most available in a pH range of 6.0 to 6.9. Most plants grow best in soils within this range and, fortunately, the majority of packaged plant soils are formulated to be slightly acidic, that is, with pH levels between 6.0 and 6.9. Many plants are quite tolerant of an even wider range in soil pH. So, in the vast majority of cases, pH shouldn't matter to the house plant grower.

But some plants are particular. If they don't have a properly adjusted soil pH, they'll put out leaves with bright yellow veins that create a fishbone pattern. Frequently this happens to a plant that demands a strongly acid soil but hasn't been receiving regular doses of acid fertilizer. House plants that need a very acid soil (pH of 4.5 to 5.5) include the
zephyr, dracaena, the purple
value higher and elements such as
agent, calcium.) Adding lime supplies
and eggshells contain the nutrient
are a number of materials that can be
ditions are preferred by most cacti, the
infundibuliformis, Gardenia jas-
(Aphelandra), Crossandra
zebra plant
passion plant
(Chlorophytum), as-
spider plant
(Platycerium),
Neutral
minoides, hydrangea, achimenes
and
major nutrients such as nitrogen and
meal all reduce soil acidity. (Bone meal
(pH of 7.0) to alkaline (above 7.0) con-
with the liming or acidifying
worked into it is likely to be in the av-
range of 6.0 to 6.9. The or-
organic matter is able to “buffer” the soil
against wide fluctuations in acidity or
alkalinity. It serves as a reservoir of hy-
ions in soil solution react
with the liming or acidifying
materials. Without organic matter, it
would take only about one pound of lime to significantly affect the acidity of
and fifty tons of soil. But it may take four to six thousand pounds of lime to do so in actual practice.
These are the kinds of numbers a
farmer with acres of land to worry
about has to work with. The buffering
effect of organic matter in a six-inch pot exerts a similar effect in the soil, but on a much smaller scale. The lime acts in a pot in only a few days, while it might take months in a corn field.
Clay particles have a buffering effect similar to that of organic matter. A clayey soil, just like one with lots of organic matter, needs more lime than an equivalent amount of sandy soil. Sandy soils contain fewer clay/humus particles to hold nutrients, so they are buffered that much less. Such coarse
soils need less lime to cause a change
pH, which is why cactus soils require
ly a handful of bone meal in a large
bucket of mix.
By juggling soil ingredients, you can
design different mixes to suit the needs
of all your plants. The thing to keep
mind is that you can move soil pH up
or down, but this won’t provide any
nutrition to your plants if that
nutrition is not already present in the
mix. All the pH does is influence the
availability of the nutrients.
Four Basic Mixes
The following four mixes include
plenty of organic matter, so they are
pretty well buffered. The pH of the
original mix should withstand the

Houghton Mifflin Company, Boston.)

Taylor’s Encyclopedia of Gardening, 4th edition,
Houghton Mifflin Company, Boston.)
The pH essentially is governed in each
mix by the amount of lime, bone meal
or organic matter that is added to the
mix. Each of these recipes produces
approximately one bushel of mix. We
thought a bushel was a lot of mix until
we broke it down to some relevant
units. In dry measure, a bushel is equal
to 128 cups or 32 quarts. This is the
same as 128 three-inch pots or 48 five-
inch pots worth of soil. So a bushel
actually is equal to an average-size col-
lection of house plants.
For cacti and succulents, which are
accustomed to dry, coarse soils tend-
ing to the alkaline, this mix is recom-
ended:
12 quarts (2 parts) sharp sand
12 quarts (2 parts) loam (soil)
6 quarts (1 part) crushed crockery or
brick
3 quarts (½ part) leaf mold (humus)
1 quart bone meal (a five-inch potful
for each bushel of mix)
1 quart ground limestone
A mix that is close to neutral pH and
good for such plants as geraniums,
Bone meal has been left out and acidic soil is resulting from using too much lime. Overliming peat moss has been added to the acidic soil, which results from repetitive fertilizing and inadequate watering. This overloads the soil with excess fertilizer salts, causing familiar white or brown crusts on the soil surface and the pot rim. We found a badly crusted pot of English ivy here at the office and tested its soil with a pH meter. The meter gave an 8.5 reading. The ivy was, understandably, pale and droopy.

This condition can be corrected by removing the crusted material from the surface of the soil with a fork, then running distilled water through the soil two or three times. Tap water shouldn't be used because it adds its own dissolved salts. Water the plant as usual after this treatment and don't fertilize until you see an improvement in your plant's color and growth. As a last resort, wash soil from the roots, and repot the plant in fresh mix and a new pot.

Testing, Testing

If you know the pH of your soil, you can lime it easily enough, but it's best to contact your county agent for suggestions on what kind of fertilizer is best for that potting mix you want to use. But you may have to go even further if you're using a prepackaged potting mix. A recent test of twenty different commercial brands of potting mixes conducted by Pennsylvania State University soil scientists shows that many packaged mixes may be too acid or nutritionally unbalanced for most house plants. Nine of the tested mixes had very low pH readings, 5.5 or less; eight had too much potassium, three had too much nitrogen and nineteen had little phosphorus.

For a complete diagnosis of soil conditions, it's a good idea to send a sample of your garden soil or potting mix to your state university or county agent, who can perform a complete nutrient assay. There may be a nominal fee of a few dollars for this service. Also, kits can be purchased at garden centers, with complete instructions on performing your own tests. Whichever you choose to do, you'll be able to make a more intelligent decision about feeding your plants and pH adjustments, and be assured of healthier plants and larger yields throughout the growing season.

Cultivation of Cyclamen fatrense in the garden

by Josef Halda
Czechoslovakia

Cyclamen fatrense, as its name indicates, originates from the limestone mountains of Velka Fatra (the Slovak section of Czechoslovakia) and adjoining limestone parts of the Low Tatras, where it grows in mixed forests at lower to medium elevations, mostly below 1,000 meters above sea level. After studying this plant for several years in nature as well as in the garden and comparing it with the closely related C. purpurascens (C. europaeum), I and my friend Dr. J. Sojak described this plant as a new species.

It can be easily propagated by seed and by cuttings so that within a few years I was able to produce well over a thousand plants. The color of its flowers is mostly salmon pink, but occasionally it was possible to find forms with very dark as well as with light pink flowers. To my knowledge, no white forms have been discovered as yet. However, since my first encounter with this plant, I cherished the hope of developing a white cultivar. For fifteen years my efforts were fruitless. Every year I sowed thousands of seeds and although I produced several thousand blooming plants, all were pink, with the salmon pink predominating.

Fortunately, the culture of C. fatrense is simple: forest soil or leaf mold, mixed with half sand and half cow manure, must be kept moist throughout the year and the location must be shady. The plants do not tolerate strong sun. The seedlings, while they are growing, require weekly treatment with a complete mineral fertilizer that includes trace elements. This species is highly resistant to fungal infection and its main pests are slugs and later mice or other rodents. With intensive and careful cultivation it is possible to produce after a year or two a 2-3 cm diameter with 3-5 leaves. Many of these plants will bloom already in the second year. Seed has to be sown fresh, or as fresh as possible, and should be covered with a 1-2 cm thick layer of sifted leaf mold.

In time I was able to select several very light pink and also very dark red forms that I numbered and cross-fertilized according to a system that was developed by the Moravian monk Gregor Mendel in the last century. Among the seedlings from the years 1984 and 1985 that bloomed in 1987, there was one pure-white flowering plant, the first such cultivar of C. fatrense that I named "Dick Redfield" in honor of my good friend who is one of the best growers of woods wild flowers in the USA. He was the first recipient of this cultivar.

Last year I liquidated most of my plants and kept only a small part with distinctly differing colors. The corms were sent to the USA and Canada, where I hope they will please their growers with their lovely flowers. At the same time I removed from my garden all plants of C. purpurascens be-

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cause it easily hybridizes with *C. fatre-nse*. I described one of such intentionally developed hybrids and named it *C. X. Marksii*, in honor of a well-known grower of bulbous plants in Bohemia. Among the many corms of *C. fatre-nse* that I sent to various gardens, there will almost surely be some with spotted leaves, which is the unwanted hybrid with *C. purpurascens* and I apologize for such occurrence. With this possibility in mind, I designated some of my shipments as *C. X hybridum*. The hybrid is expressed mainly in the F₁ generation as seedlings of the now blooming plants. I hope that this will not affect the pleasure of growers who now have my plants in cultivation. I will continue to try developing other interesting color varieties and I hope that I will be able to increase the circle of *C. fatre-nse* growers in my country as well as abroad. This is the best method by which natural populations can be preserved and protected against indiscriminate collecting.
First Primula Photo Show
Additional winners

Div. II Section D. Best in section. Seventeenth century silver-laced polyanthus raised from seed by Alda Stick of Freedom, Maine. The judges felt this was really two pictures. With a dividing line running down the center, it's almost like a mirror image. But what a nice clear photo of plants and leaves! And what a lovely plant!

Div. XI Section D. Second award in the Section. Primula saxatilis, raised from seed by Alda Stick of Freedom, Maine. The judges considered the composition to be "outstanding. The curves and verticals, especially the three uprights are very good photography."
Above: Div. XI, Sect. E, 1st award in section. *Prim. denticulate*, grown from seed by Arlene Perkins of Montpelier, Vt. The color, detail and shading of the flowers here is excellent. The flowers at the top of the scape obscure the form of the "drumstick" and should have been snipped away before the photograph was made.

Opposite page: Div. XI, Sect. E, 2nd winner in section *Primula denticulate* grown from seed and photographed by Wally Alberts of Amherst, N.H. Except for the top and largest flower head on which the highlights were so bright that it washed out, this is a marvelous picture. Wonderful depth and coloration. The dark background is wonderful, too.
Above: Division III, Sect. E. Best in division and section Primula “Wanda” hybrid grown from Thompson & Morgan seed by Arlene Perkins of Montpelier, Vt. The judges ranked the simplicity and moodiness of this photo high. It's abstract, and that's its charm. A bit of light bounced in with a white board might have improved it – not that it needed much.

Eastside Primula Society

SPRING SHOW

Place: Totem Lake Mall, Kirkland, Washington
Time: April 15 – 16, 1989
Theme: “Primroses Around the World”

Sweepstakes – Thea Oakley

Runner-up – Rosetta Jones

Division I
- Double Acaulis
- Hose-in-hose
- Vulgaris Acaulis

Division II
- Polyanthus seedling
- Jack-in-green
- Cowichan

Division IV
- Stalked Juliana

Division V
- Hybridizing

Division VI
- Garden Auricula
- Garden Auricula double

Division VII
- Species Saxatilis
- Malacoides
- Veris Species Hybrid
- Denticulata

Division IX
- Alpine Auricula

Division X
- Laced Polyanthus

Division XI
- Oddities

Division XV
- Companion plants

Horticulture

Sweepstakes – Thea Oakley

Special Award – Lena Smith

Runner-up – Beth Tait

Design – Mildred Gaulke and Dene Henderson

Mini Alpine Gardens – Thea Oakley

Beth Tait, Awards Chairman
From The Treasurer,

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A generous member near Portland, Oregon was kind enough to provide your Editor with a copy of Blasdale's 'Cultivated Species of the Genus Primula' for which he is most deeply grateful. There is another important book missing from the editorial shelf — Doretta Klaber's 'Primroses and Spring!' If any of you readers have a copy which you can spare in a good cause (you will be compensated) please contact Mr. Critz at your earliest convenience.