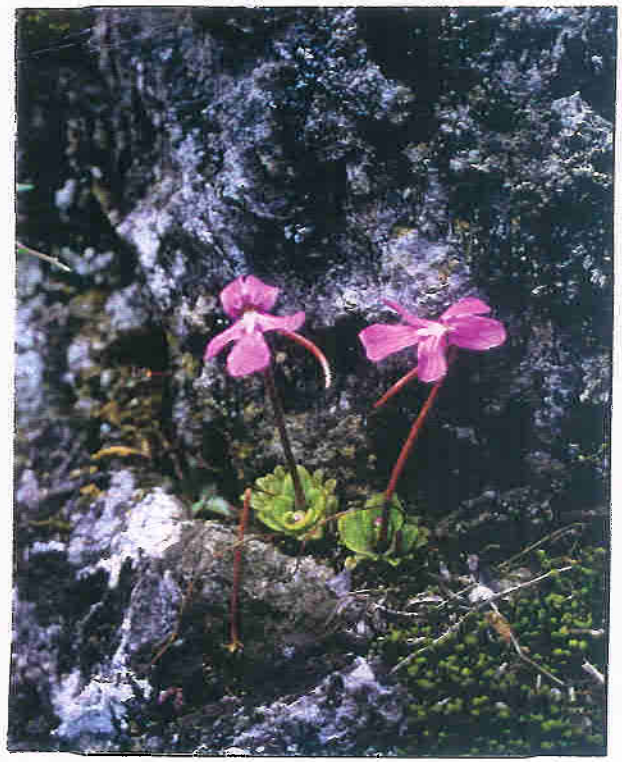
THE INTERNATIONAL PINGUICULA STUDY GROUP

Newsletter No.7

January 1996



Pinguicula sp. 'Puerto del Aire'. Photographed by Ing. Zdenek Jezek

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INTERNATIONAL PINGUICULA STUDY GROUP

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AIMS OF THE I.P.S.G.

1. To meet with other collectors of the species and primary hybrids.
2. To provide a forum for the exchange of information between any interested parties
3. To assist the exchange of seeds internationally to improve access to species so that they are perpetuated in cultivation.
4. To encourage the use of botanically correct names or otherwise the use of *nomina nuda* until the plant has been officially described as a species.
5. To encourage accurate record keeping.
6. To re-introduce "lost species" into cultivation.
7. To encourage and help the preservation of habitats in all countries where *Pinguicula* grow wild

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EDITORIAL

From the initial conception of the I.P.S.G., through the production of the first "hand - sewn" Newsletter, the introduction of colour in five further Newsletters, the first ever *Pinguicula* convention, and the study visit to Mexico, one person has provided the driving force - MR.S.E.LAMPARD. Well, after three years of non-stop effort Stan has decided to take a rest from the editorial duties of this Newsletter, leaving me to continue to build on the firm foundations laid under his guidance.

As you will have seen on the inside front cover of this issue, the group now has access to 'The Net'. Loyd will now co-ordinate any Study Group activity making use of this facility, and hopefully this will ultimately prove to be a useful extension of our methods of information exchange. This will probably open up a whole new world to our Group and I would welcome any suggestions of how we can take full advantage of this opportunity.

On a more disappointing note, the response to the seedbank has been poor. Once again the number of requests for seed has been high, but deposits have been low. This leads to frustration, not only for those who have requested seed, but also for Chris, who receives very little thanks and quite a few moans. If you think that this service is worth continuing, (if not then let me know), then please pollinate your plants, cultivate your seed and make a deposit in the bank. If you are unsure of pollination techniques a fact sheet is available from Chris for the price of a S.A.E. or International Reply Coupon. The sheet also includes a small piece on growing from seed, and so I think is well worth having.

Membership continues to grow steadily, and as the keeper of the books could I refer everyone to the request at the bottom of the inside front cover re : PAYMENT.

Many thanks for your continued support and input to this and future Newsletters, RON

Pinguicula Hunting in Mexico

Ing. Z. Yezek

I was leaving for Mexico last March with a plan, or rather a desire to find *Pinguicula* sp. In their natural habitat. It is true that I had seen them growing in the wild, but it had been "only" here or somewhere else in Europe. That is not to say that moderate climate flora is uninteresting, but the Tropics are quite another thing and I wanted to visit places where the beloved plants I was growing so painfully grew naturally. I was curious what I would find although I have to admit that *Pinguicula* are not (or rather, were not - before my trip to Mexico) my favourites among carnivorous plants.

I started my search for *Pinguicula* right from my first steps on Mexican soil, empowered by Knowledge of all available literature, tuition of Dr. Studnicka, and enthusiasm. Several days after the arrival, I and my friend - a mountaineer - attempted to climb Orizaba (5,600 m.), The highest peak in Mexico. My friend was motivated by his passion for rock climbing, while I set out on this hike for purely sport - and botanical - purposes. I wanted to take this opportunity to "feel" all vegetative zones in Mexico (including the zone of snow and ice several hundred metres below the summit). I took for granted that I would find some *Pinguicula* along the way. My disappointment was therefore all the more bitter; I did not find a single *Pinguicula* and what more, we had to stop about 400 m. below the summit due to a heavy snow storm.

I was not any more successful in the next few weeks either. I knew that *Pinguicula* were then at the stage of "winter" rosettes and I searched places which were recommended to me for houseleek (*Sempervivum*) or *Echeveria* shaped forms. I had not had the opportunity then to have seen these forms, because my *Pinguicula* never formed the "winter" rosettes due to the all year round high temperatures in the greenhouse. This could be the cause of my initial failure, although I also have to admit that I focus more on the epiphytic flora and therefore had a tendency to look up rather than down. As far as the "planned" find is concerned, I did not hope for much, as I knew that, although 13 different species of *Pinguicula* had been described from Mexico, those were mostly plants growing at a single location or a very small territory, and one could not find them without sufficient Knowledge of the landscape or an experienced guide. I could possibly hope for *P.moranensis* or *P.lilacina*, however I had to account for a surprise and also there was always a hope. In my case ,I nearly lost all my hopes, for I had not found a single specimen in five weeks of intense searching, although (as I found out later) I walked past the places where they were growing several times!

One day, just four days before my departure, I was returning from the town of Orizaba to my hotel in Tehuacan by bus. The road winds through the famous saddle Puerto del Aire. This locality in itself would be worth a separate article because of its exceptional features and beauty. It creates a border between the arid tropics (?) of the Tehuacan Basin and the Atlantic humid climate, which is typical for most of the territory of the coastal state of Veracruz, in the altitude of around 2,000 m. The buses crawl up the serpentines of the steepness unseen back home. A botanist hanging on a handle in an overcrowded bus, and looking over the heads of his luckier co-passengers, has enough time to study the vegetation along the road, which changes very quickly as we reach a higher altitude. From that position, I suddenly caught a glimpse of familiar *Pinguicula* blossoms, which I could not mistake for anything else! They were bigger and more colourful than anything I had seen before.

I had to go back the next day. There were hundreds of blossoming *Pinguicula* with a considerable variability of blossoms. Most specimens blossomed from the winter rosettes and only a few had developed carnivorous leaves. No wonder that I could not find them before; the rosettes were very small and inconspicuous and perfectly camouflaged with dry remains of the summer leaves and other shed material. The *Pinguicula* grew individually or in small groups in rock crevices, but also in the grass partly shaded by low shrubs. The slope faced south-east and it was so steep that it was difficult to stand on it. I was surprised by the water conditions at the locality; it was very dry, and although the dry season was coming to an end, the composition of the surrounding vegetation did not suggest any significant improvement during the rain season. The humidity was not high either, epiphytes still occurred only rarely. In our collections, we usually torment *Pinguicula* in water all year round, while here the soil could never get soaked (note the steeples and the exposure of the slope). The composition of the soil resembled the soil of our alkaline mountain meadows in the altitude of 800 m. and above. I followed this experience when I tried to implant the imported specimen in the growth at home and they have been growing well so far.

I have to say that as the season of their blossoming came nearer, *Pinguicula* suddenly cropped up everywhere. Despite having only a few days left, I still managed to find several nice localities with *Pinguicula*. I am not yet sure about the precise species of the specimens I found, but I do not think it will be anything extraordinary. Yet I value them, because I was able to find them in their beautiful natural habitat and therefore they are not degenerated by long time torture in artificial growths and repeated vegetative reproduction. Moreover, I had time enough to study the conditions at the locality, which is always very important for a botanist and plant grower. I say "very important", rather than "most important", because I know several people who do not even possess a passport and still have such "pieces" in their collections that many world class botanist adorned with degrees would bow to them.

VARIATIONS EXHIBITED BY SEED RAISED PLANTS OF *Pinguicula ehlersae*

Loyd Wix
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England

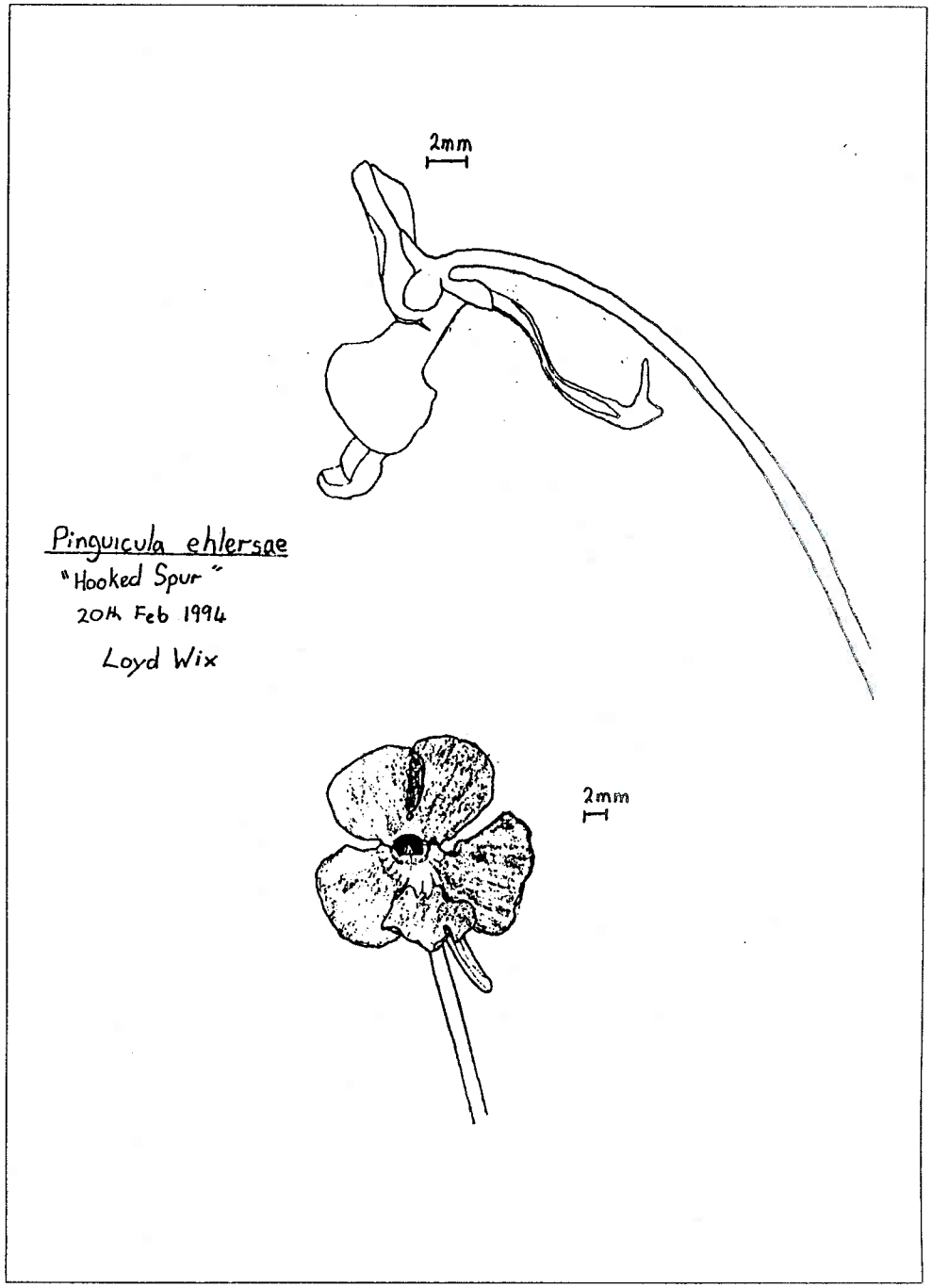
During a telephone conversation with Ron Mudd, one February evening, for some reason or another *P. ehlersae* became a topic of discussion. We had been talking around the subjects of pollination, hybridisation and seed production when I remarked that my *P. ehlersae* set seed when self pollinated. Ron had not heard of *P. ehlersae* producing seed in cultivation, indeed some seed in the seed bank, labelled as *P. ehlersae* turned out to be *P. moranensis* when grown. My original plants came from the Oxford Forestry Institutes Micropropagation laboratory at Wytham, and was initially labelled incorrectly as *P. cyclosecta*. As plants from this source are widely grown, I had assumed that seed would be relatively plentiful. After all if my plant set seed surely all other plants micropropagated from this source would also do so.

The first seed that I harvested from my plant was sown in Spring '91, and the surviving seedlings reached maturity last year. I told Ron that I had these reasonably sized seed raised plants and that some were flowering. Ron questioned me regarding the appearance of these in comparison to the parent plant. I couldn't answer this very well as I had not been paying particular attention to these plants. I could however remember that one plant did look quite different from the rest.

After our conversation, I immediately went to inspect the plant now that my attention had been drawn to them. On looking at the plants some differences were apparent. In all, four plants exhibited considerable differences from the parent. These differences may be summarised as follows:

Plant 1 - Dark Red Leaf Form - The leaves of the winter rosette are coloured dark red on the upper surface with the exception of the leaf margin which is pale green. The underside of the leaf is the same pale green as the parent.

Plants 2 and 3 - Red Flushed Leaf Form - These plants also have the presence of red coloration on the upper surface of the winter leaves. In these plants the colour is diffuse in comparison to the previous form, giving a flushed appearance. Again the under surface of the leaf is pale green without any red pigmentation.



Plant 4 - Hooked Spur Form - In this plant the colour of the winter leaves is identical to those of the parent, i.e. pale green without any red pigmentation. The differences on this plant are found in the flower. The first obvious difference is the presence of a hook shaped appendage on the spur, (fig.1a.). As the flower develops this appendage becomes erect upon the upper surface of the spur, the fully developed spur is 'S' shaped. In addition to this the cream blotch on the lower lip is larger, being present on all three lobes around the entrance to the throat. The middle of the three lobes on the lower lip is slightly folded giving it a frilled appearance in comparison with the flat face of the parent flower.

Possible associations between *P. ehlersae* and *P.* 'Ascension' ???

Should further differences become noticeable, these will be reported in a future Newsletter. Besides these plants, there are several more seed raised plants that are identical to the parent in terms of leaf form, but which have not yet flowered. Thus any differences in flower will have to wait until later.

Variations are apparent in many species of *Pinguicula,* take for example the many forms of *P. moranensis* or the flower forms of *P.emarginata*. Thus the differences noticed in these seed raised *P. ehlersae* plants could suggest that further variations may be anticipated in seed raised plants of other species more frequently propagated by asexual means. Propagation of more species by seed could potentially provide useful information upon the amount of variation that may be anticipated in wild populations of these plants. Given the current situation with respect to *Pinguicula* nomenclature and the introduction of new plants into cultivation ahead of scientific evaluation, observations on the variability of cultivated populations could assist in removing some of the confusion that exists in some areas. It would be interesting to hear of any other experiences of variations in seed grown plants. Perhaps the Study Group should consider compiling a register of plant known to produce seed in cultivation, including such information as to whether self pollination will succeed or if two different clones are required. This project if undertaken could even assist in increasing the supply of seed to the seed bank !

Persistence often pays off

Bruce Pierson
Queensland
Australia

In the early days of my C.P. collecting, I was very keen to get any new species that I didn't have, and was often able to get seeds from overseas contacts. By this method, I acquired several *Pinguicula* species seeds. These were *P.alpina, P.corsica,* and two sub-species of *P.grandiflora.*

I sowed the seeds on a mix of 4 parts peat to 1 of sand in seedling punnets, and covered the punnets with cling wrap, and placed hem in the meat compartment of the refrigerator, just under the freezer. In this situation, the potting medium was just above freezing point, with a light frosting on the very top of the medium where the seeds were. The punnets stayed there for about six weeks, after which time they were placed in my planthouse.

After waiting several months, nothing happened. I thought maybe the seeds had been no good, but remembering something I read in Adrian Slacks book, I decided to re - stratify the seeds in the hope of better success next time. Adrian had stated that sometimes *Pinguicula* seeds didn't always germinate after winter stratification, and would sometimes remain dormant for a further year, coming up the following year.

After another six weeks in the fridge, the seed punnets were returned to the plant house again, and another period of waiting produced still nothing. Not one to give up easily, I decided that I'd give them one last go, and if nothing happened this time, then it would be curtains for the lot of them.

Another six weeks of stratification , and the punnets were again returned to the plant house. This time I had more positive results, with a good germination rate. Maybe the seeds had E.S.P. and knew it was their last chance ?? Or was it just that the growing conditions on the first two attempts had not been suitable? Maybe it was the wrong time of the year? This happened several years ago, so I have no idea what time of year it was.

Its probably a good lesson though, in that it doesn't pay to give up too soon. I've also had other seeds behave in this way, as a pot of *Drosera planchonii* once took three seasons (two years) to germinate.

Sadly the *Pinguiculas* only survived a few years in the temperate climate of N.S.W. as it was too warm for them in the summers, and the winters were nowhere near cold enough. Even refrigerating the resting buds was not entirely successful, as it only took care of the winter, and the hot summers would force them into an early dormancy, resulting in smaller buds than at the start of the growing season. But at least it was knowledge gained, which may be of use to other growers.

Now that we have moved to Queensland, I would give cold climate *Pinguiculas* no chance of surviving up here, without being in a totally artificial climate controlled enclosure. One day when I get my C.P.s organised again, I might try such a venture, as many of the cold climate *Pinguiculas* are quite interesting to grow.

SEED BANK

P.alpina	*P.grandiflora* (V. large Irish)
P.hirtiflora	*P.longifolia* ssp. causensis
P.lusitanica	*P.vulgaris*
P.caerulea	*P.ionantha*
P.planifolia	*P.primuliflora*
P.ehlersae	*P.moranensis*
P.rectifolia	*P.rotundiflora* (possible hybrid ?)
P. x Sethos (self)	*P.* x Weser (self)
P.sharpii	*P.laueana*
P.acuminata	*P.agnata x P.hemiepiphytica*

A big thank you for your seed donations, please keep up your support.
Please list alternative choices when ordering as some seed is in very short supply.
If alternatives are not listed and no seed of your choice remains in the bank your request will remain 'on file' until more of that species becomes available.
Send payment after you have received your order. - CHRIS

Pinguicula Search In France

D.A.Venthem
Southampton, England.

In July 1991 I along with Kevin Hughes proceeded on a field trip in an attempt to achieve the following

Objective Seek out and photograph P. longifolia ssp. caussensis, P. alpina, P. grandiflora ssp. rosea and P. grandiflora f. pallida growing in their native habitat.

We only had three days in which to do this.

On arrival at Cherbourg we headed straight for the Massif Central, when we reached the general area we stopped to stretch our legs and on so doing found that it was teeming with insect life, especially butterflies with many species to be seen. We then continued to the eastern part of the Massif Central and stopped at a point where we overlooked a very deep gorge, it was a magnificent sight, it continued in both directions as far as the eye could see. The road spiralled down into this chasm to a village which catered for tourists. We descended and then began to scour the base and steep sides of the limestone gorge and soon found several colonies of P. longifolia ssp. caussensis. It was a picture to behold to see colonies growing 20ft.+ on the vertical rock face, surprisingly these plants were exposed to bright sunlight and consequently were smaller in growth than those growing elsewhere, they had a yellowish/orange green colouration and the leaves were crinkled. On exploring the area larger specimens were seen growing in shaded areas, they were found on the under side of rock overhangs and at the base of the cliffs behind bushes, here they were very green in colour forming good sized rosettes.
A number of dried seed capsules were present thereby I took the opportunity of collecting seed as well as taking photographs.

After our stop at the gorge we drove eastwards for awhile and then stopped at a campsite for the night.
The following morning we made our way to the Alps, to Palmalan mountain. A road ascended a good way up this mountain before we had to park and take to foot. Many people came here to roam through the alpine meadows, which when we arrived were a blaze of colour, a number of orchids could also be seen. Kevin and I ascended higher, trailing carpets of *Dryas octopetela* were viewed and at one point we saw *Gentiana acaulis* growing amongst tufts of grass clinging to some rocks. We were very warm through exertion and soon dripped with water from the heavily saturated air, mists cling to the mountains frequently forming a heavy veil which only clears for several hours. After making our way around to the north side of the mountain, at a lower level we came across P. alpina growing amongst grass, while at a much higher level it

was found growing in the rock face in limestone crevices where a little detritus had gathered. The plants receive water through seepage and the leaves are kept moist from the mists. Again I was able to collect seed.
We drove away from the mountain to now look for P. grandiflora ssp. rosea the area being near to Grenoble, unfortunately not having the time to prolong our search we were unsuccessful.

Moving on we crossed the border to Switzerland where we stayed the night. The following day on rising early we set out for the Jura mountains, once there we found a small colony of P. grandiflora f. pallida growing on limestone boulders at the side of a road, it was good to see these in full bloom.

It was now time to make the long trek back to Cherbourg and home. The objective we had set ourselves had almost been accomplished, of the four plant types three were located and photographed.

Cultivation details for those Pinguiculas searched for in France.

Seed collected should be stored as soon as possible in a refrigerator preferably within a temperature range of 3C. to 5C.. When mid-winter arrives the seeds need to go through a process of stratification, this can be achieved by sowing the seed on the recommended compost for the mature plant and exposing the pots, which are stood in shallow water, to frost several times. Seedlings are pricked out when large enough to handle. As Pinguicula alpina will die through root disturbance, the seedlings must be transplanted into their permanent pots (Slack, 1986).

P. longifolia ssp. caussensis. In the south of England it is being found to be one of the easiest hardy European Pinguiculas to cultivate. Two plants grow well in a 5" dwarf pot in a compost of 4moss peat :2 JI2 :1sharp sand :2perlite :1tsp.ground tufa :0.5tsp.ground chalk, with a couple of pieces of tufa rock embedded in the surface.
As these plants do come into growth very early in the year I do provide, when there is a danger of frost, further protection by covering cloches with pieces of fabric, although the hibernacula are fully hardy, new growth could be susceptible to frost damage. I have observed in cultivation as in its habitat that these plants will tolerate greater light intensity then is generally accepted by Pinguicula species.
The flowering period can begin from March and extend to July, an unusual observation is that some plants will flower repeatedly within the season, up to three waves of flowering have been noted. I have found these plants to be generous in their production of hibernacula and gemmae.
'Tray system' of watering is used, during the growth period pots are stood in very shallow water and when dormant compost is just moist.

I grow *P. longifolia* and *P. longifolia ssp. reichenbachiana* in the same way.

P. alpina. Up to three plants to a 5" dwarf pot in a compost of 3moss peat :1 JI2 :2sharp sand :2perlite :1tsp.ground tufa :0.5tsp.ground chalk, with a couple of pieces of tufa embedded in the surface. These plants need to be kept as cool as possible throughout the year, I grow these in shade where they receive light from a northerly direction.
'Tray system' of watering used as for P. longifolia.

P. grandiflora. Up to two plants to a 5" dwarf pot in a compost of 3moss peat :1.5 JI2 :1sharp sand :1perlite :<1tsp.ground tufa. Good light required, north facing ideal, needs to be protected from high light intensities.
'Tray system' of watering used as for P. longifolia.

References

Insect-Eating Plants, Adrian Slack, 1986.

Further Observations on Growing Cabinets for *Pinguicula*

Andy Carter
Bishops Stortford
ENGLAND

Following my article in IPSG Newsletter No. 6, April 1995, another winter has passed and I thought it might be useful to pass on some further observations on the use of my home made cabinet.

The basic cabinet is still the same, although the water tray has now been lined with glass fibre (there were dozens of pinholes!), and electronic thermostats have been installed. The polycarbonate sheets have been replaced with glass, as the plastic buckles under the heat of the lights and condensation seems to obscure more light than with glass.

Last summer I took leaf cuttings from all my Pinguiculas, and placed one set in the greenhouse and another in the cabinet. The plants in the cabinet seemed to be doing well while the outside temperature was mild, but during particularly cold and frosty times a large number of plants seem to keel over and die. I have not used any sprays this year, so I cannot blame Benlate this time!

To my surprise many of the surviving plants appear to be showing a winter leaf formation at the moment (early May). I assumed that the cabinet would have provided an artificial environment similar to a perpetual summer with controlled heating and lighting so winter rosettes would be less likely to form and less likely to persist until this time of year.

Obviously the lighting cannot be a factor, being artificial and automatically timed to 14 hours per day, the water tray is heated using one heater for overnight temperature setback and two for higher daytime temperatures, both thermostatically controlled and switched by the same timer as the lights, I believe this to be sufficient to keep the water bath at the required temperatures, even allowing for the cooling effect of passing air through the water, plus the latent heat of evaporation. This would seem to leave only the ambient conditions as a variable, and I can only assume it is somehow due to the cooling of the upper regions of the cabinet allowing the air temperature within to fall, but this temperature drop cannot be that great, especially in the centre of the cabinet, as the water tray is kept at 30°C during the day, and the plants stand approximately 40 cm above this. If this cooling is a major factor, then I would expect losses to be greater close to the outside edges, but the losses occurred across the whole cabinet. Other plants in the cabinet, such as *Heliamphora* and *Drosera* species suffered no losses, apart from *Drosera indica*. The main principal of such a cabinet is that the plants are not in contact with water anyway, so the atmosphere should be self regulating in terms of relative humidity, unless it is caused by condensation on the leaves, but this would require that the leaf temperature be below the air temperature, and again because of the close proximity of the plants to the water level, I do not believe this to be the case. I must admit to being rather puzzled and frustrated.

We are forecast some night frosts later on this week, so I will try to monitor the internal maximum and minimum temperatures for a few days. Perhaps a solution is to place the whole assembly within an insulated and draught proof box. Another project!

The plants in the greenhouse fared rather better with fewer losses.

The sloping side walls of my new (second hand) greenhouse let in a certain amount of water which collects on the concrete floor, amounting to quite a puddle in very wet weather such as we have experienced this Spring, because of this I added very little water to any of my plants over the winter (for fear of encouraging *Botrytis*) to the extent that most pots became somewhat desiccated. My *Pinguiculas* are in a separate area in a shaded polythene tent containing a humidifier controlled by a thermostat and time switch, so that on hot days even in winter, they would receive some additional water but generally they were kept very dry. Heating is provided by a thermostatically controlled Propane gas heater to a minimum of 5°C, although on a couple of occasions it probably dropped to freezing when I was late home. By now I have started watering again, and temperatures permitting, the humidifier is on for some time during the day. I water very sparingly even in summer and rely on the humidifier to water from the top. (For interests sake, it is a spinning wheel type, which provides quite a heavy mist when running.)

I list below the plants that either survived or didn't in both situations in case the information is useful to anyone else:-

Plants that survived in cabinet

Pinguicula emarginata, P. 'Santa Rita', P. agnata 'el lobo', P. agnata round, P. ascension, P. ayautla, P. gypsicola, P. gypsicola x agnata, P. hemiepiphytica, P. Jaumavensis, P. laueana, P. moranensis 'La Vuelta', P. moranensis 'Las Ventanas', P. moranensis 'kirkbright', P. moranensis 'morelia', P. potosiensis, P. x weser, P. zecheri

Plants that survived in greenhouse

Pinguicula 'Santa Maria Yacuuti', P. 'Sierra Mazatecas', P. acuminata, P. agnata round, P. agnata typical, P. emarginata, P. esseriana, P. gypsicola, P. hemiepiphytica, P. laueana, P. macrophylla, P. moranensis 'El Chico', P. moranensis 'Fraser beaut', P. moranensis 'Guerrero', P. moranensis 'la Vuelta', P. moranensis 'las Ventanas', P. moranensis 'Molango' , P. moranensis 'Santiago', P. moranensis 'morelia', P. potosiensis, P. rosei, P. zecheri

Plants lost in both greenhouse and cabinet

Pinguicula crassifolia, P. 'Huahuapan', P. ehlersae, P. gracilis, P. moranensis 'alba', P. reticulata,

Plants lost in cabinet

Pinguicula 'Santa Maria Yacuuti', P. 'Sierra Mazatecas', P. 'Sierra Mixe', P. acuminata, P. agnata typical, P. emarginata, P. esseriana (Viv), P. moranensis 'El Chico', P. moranensis 'Fraser Beaut', P. moranensis 'Guerrero', P. moranensis 'Molango', P. moranensis 'Santiago', P. moranensis 'alba', P. rosei, P. rotundiflora, P. rotundiflora 'rayones', P. x kewensis,

Plants lost in greenhouse.

Pinguicula 'Santa Rita', P. agnata 'el lobo', P. ascension, P. ayautla.

As a result of speaking with other growers, it seems those who grow predominantly indoors or in better insulated and heated greenhouses seem to suffer fewer losses generally. This would seem to indicate that stability of temperature and humidity is an important factor affecting successful growth, whereas the extremes to which my plants have been subjected point to the fact that low temperatures with very little water may be less injurious than moderate temperatures with relatively high humidity.

Finally, a note about composts. Last year as an experiment I tried using peat containing small lumps of chalky clay as a compost with several species (inspired by Miloslav Studnicka, 'Comments to "Difficult" Pinguicula Species', IPSG Newsletter No. 4, February 1994). Growth in summer seemed to be a little better than perlite/vermiculite, but over winter, these trial pots have much better rosettes. Obviously the peat has dried out completely, as would perlite/vermiculite, but perhaps the clay has held just enough water to sustain the winter rosette.

THE TRADITIONAL USES OF *Pinguicula* IN FOOD

Part 2. The Use of *Pinguicula vulgaris* in the Preparation Of Tätmjölk.

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Introduction.

This second article concentrating on the Scandinavian fermented milk tätmjölk, again relies heavily upon three Swedish and Norwegian articles (refs.1,2,3) based on information generated as a result of an ethnological study carried out in Sweden from 1870 onwards, and the extensive surveys carried out on the dairy economies of Sweden and Norway.

The use of *Pinguicula vulgaris* in the preparation of tätmjölk has been the widest use of *Pinguicula* in food mentioned in the literature. Despite this, *Pinguicula* were not exclusively used to produce tätmjölk with the Sundew *Drosera rotundifolia* also being used. Both *Drosera* and *Pinguicula* have the Swedish folk name of "tätgräs" or thickening grass thus alluding to the use that both plants were traditionally applied. In addition to these two vegetable sources, there are a few recorded instances from Sweden of the use of a certain type of snail as the inoculant. The only thing that these three inoculants have in common is their sliminess, and it is suggested that the use of these substances arose as a result of 'like magic'. Basically, in order to obtain a thick, ropy, slimy fermented milk an inoculant with similar characteristics would be added (such as a slimy snail, a muscilagenous *Drosera* leaf or a greasy *Pinguicula* plant). For what ever reason, *Pinguicula vulgaris* is mentioned most often as the inoculant for tätmjölk. The term tätgräs first appears in print in Sweden in 1716, though it is Linnaeus who first mentioned *Pinguicula* or tätört in relation to tätmjölk in 1737.

What is Tätmjölk?

Tätmjölk is just one of several names given to the oldest form of fermented milk produced in Scandinavia. Other names that appear in the literature are längfil, langmölk, tättemjölk, langmjolk, filbunk and stjir. Tätmjölk is a thick fermented milk with a characteristic ropiness that allows the material to be pulled into long strands or ropes and confers a slimy texture. Unlike milk that is allowed to naturally sour, tätmjölk does not separate giving rise to whey. Once

produced, tätmjölk could be stored for 6 months without becoming inedible and was thus a good means of preserving seasonal surpluses of milk. These surpluses could then be utilised at other times of the year when milk supplies were not so plentiful including its use to supplement animal fodder. Although the material could be stored, some was inevitably used straight away and was called filbunk because of the intact layer of cream on the top. (The picture is somewhat confused however as filbunk was the name given to spontaneously soured milk with a cream layer in Southern Sweden).

How was Tätmjölk Made?

I use the past tense in relation to the preparation of tätmjölk, as my contacts in Sweden were unable to locate any current operations producing tätmjölk though this would not rule out the possibility that it is still made in isolated farming communities in the far north of the country. Therefore the examples that I shall quote in relation to tätmjölk preparation are from the literature and are methods used over two centuries ago.

Linnaeus reported from Dalarne in 1734 and Norrland 1737 that the *Pinguicula* leaves were picked and laid flat in a filter, through which the milk was strained. In Flora Lapponica (1737) Linnaeus further noted that "leaves are picked before hand and fresh milk, warm from the cow, is poured through it, and allowed to stand for a while to sour. Thereby milk is produced which is much thicker and firmer without the separation of whey than can be otherwise obtained. Once milk of this kind has been obtained, it is not necessary to use new leaves to obtain more of it, but half a teaspoon of the milk first prepared is simply mixed with new milk. This mixture then has similar properties, including the ability to act like yeast and convert a subsequent batch of mix".

Linnaeus also reported that *Pinguicula* leaves were used to prevent a defect in milk. During lectures given in Hammarby in 1770, he mentioned a report by Martin Vahl.Vahl reported that *Pinguicula* was used in the whole of Norrland above Gävle for tätmjölk. In summer when milk was set aside to curdle, nearly half would separate into whey with gas bubbles below the cream layer, such milk would also have an unpleasant taste. The people of Norrland attributed this problem to the milk souring too quickly. *Pinguicula* was excellent in preventing this causing the milk to become firm with a pleasant taste and virtually no whey. Linnaeus again mentioned the use of *Pinguicula* to prevent milk from curdling too quickly in 1775.

In 1749 a farmers son by the name of Nils Gisler wrote a report in the proceedings of the Royal Swedish Academy of Science in which he gave a detailed description of the production of tätmjölk in Medelpad. In this account, large handfuls of leaves were plucked and placed in the bottom of a sieve. Warm goats milk would be strained through the leaves, and the milk allowed to stand for four or five days depending upon the temperature and the time of year. An alternative approach was to rub the bottom of the sieve with fresh leaves and then to pass the milk through the prepared sieve. Yet another variation was to milk straight onto the leaves in a stone vessel. As with Linnaeus's report, Gilser states that once milk of the correct properties are achieved, the properties can be imparted on a new batch of milk by taking a couple of spoonfuls of the thickened milk and smearing the milking sieve with this.

In Norway, Bishop Gunnerus wrote of his experiences in Trondheim. Here, thick sour milk was greatly utilised as a food and tætte was generally used as it produced a better product. As tætte, the apparently widely known tætegræs (*Pinguicula vulgaris*) was used. Leaves were gathered which were placed in a dish of fresh milk until it became thick and viscous from which long threads could be drawn.

In 1806 A.J.Retzius recorded that the most important use of butterwort was for tätmjölk in Lapmarken, Norrland, Norway and Iceland. Retzius describes a similar method to Gisler involving lining a sieve with the freshly picked leaves. Retzius mentions that the resultant material was thick with little separation of whey, characteristics which were only apparent after the material had been allowed to stand for several days. Similarly to Gisler's account, Retzius noted that a tablespoonful of the thickened milk could be used to line another container which would produce more tätmjölk when filled with fresh milk. Indeed, the material was produced faster if made from a previous batch of tätmjölk rather than from the plant leaves.

E.von Greyerz, an inspector on a Swedish estate wrote about the production of "long milk" in 1874. Norrlanders would take bunches of tätgräs and place them into a milk tub which would produce "long milk" after a few days. In this document the belief that "long milk" could be produced for several milkings following feeding tätgräs to cattle is mentioned. However von Greyerz stated that the butterwort was unknown to him and was apparently becoming so rare that prudent housewives always stored "thick milk" over the winter to use as inoculant in the spring. (Perhaps von Greyerz was unaware of the formation of hibernacula during the later part of the year and hence his belief that the plant was rare).

Further reports in the 1880's by F.C. Schübeler in Norway and J.C.Svabo in the Faroes give scant details on the use of butterworts to produce "thick milk". By the time these reports were written the use of *Pinguicula* was already in decline. Despite this, an anonymous report appeared in the Berlin journal "Molkereizeitung" in 1903 providing experimental details on the formation of "long milk". As late as 1930, Else Emrich reported on the use of butterwort as "Rennet" in Sweden.

What Role Does *Pinguicula* Play in the Formation Of Tätmjölk?

Although there are many accounts of the use of *Pinguicula* to produce tätmjölk, this was not always the case with the most popular inoculant being a portion of a previous batch of material. Mention is made in this respect to the inoculant behaving like a yeast with the culture being used to produce batch after batch. Tätmjölk could even be dried and stored in this form until required for a new batch. In addition there are the documented accounts of *Pinguicula* being used when the natural souring process were proceeding too quickly. There are also those references to the use of *Drosera* and snails so *Pinguicula* were obviously not essential.

So why were they used at all? There are two potential mechanisms by which use of *Pinguicula* leaves could modify the milk:

Enzyme activity. - The secretion of protease enzymes from the leaves could attack the milk proteins thus altering the physical properties of the milk. Although some proteolytic activity may occur, in it unlikely that this activity would be carried over to subsequent batches.

Microbial activity. - The presence of certain bacteria on the surface of the leaves may act as the true inoculant, and it is the growth and metabolism of these agents that give rise to the properties of tätmjölk. This microbial activity could be carried over to subsequent batches even if the material was dried and stored.

It is probable that *Pinguicula* was utilised for the latter reason as there are many other ropy fermented milk products (such as certain yoghurts) that utilise bacterial starter cultures rather than *Pinguicula* leaves. A recent publication on fermented milk products (ref.4) states that slime producing strains of two bacteria *Streptococcus lactis* (*S.lactis longi*) and *S.cremoris* (*S.creamoris longi*) have been isolated from tätmjölk. Such bacteria form long chains of cells and in addition these organisms exude polysaccharide (starch like) materials. It is the chains of cells that give rise to the ropiness, and the polysaccharides that confer the sliminess of tätmjölk.

In the dairy industry, ropy fermentations are known for being notorious unreliable. For a while they work well providing the desired product characteristics and then all of a sudden they stop. Although the reasons for this are still unclear and surrounded in a certain degree of controversy it is suggested that the special properties are due to the presence of Plasmid encoded DNA. In bacteria the genetic information encoded as DNA is not always confined to the nucleus of the bacterial cell. Additional information may be carried in discrete packages of DNA called Plastids that supplement the biochemistry of the host bacteria. Plastids may be exchanged between bacteria (even between unrelated species) and with them the special properties are transferred. (Of concern in medical circles is the transference of antibiotic resistance from benign to pathogenic bacteria in the form of Plastid DNA). Thus it is suggested that the rope and slime producing ability of bacterial strains such as those isolated from tätmjölk is due to the presence of the relevant plastids in these strains. As with all DNA, there is an energy burden on the bacteria associated with the maintenance and up keep of the plastid. Due to this energy cost, the plastid is only maintained for as long as the host bacteria obtains benefit from doing so. Thus if a bacteria is transferred to an environment in which the presence of plastid DNA no longer conveys an advantage, it is eventually lost. It is suggested that this is the reason for the unreliability of ropy fermentations.

What may have been occurring in the Scandinavian tätmjölk operations is that usually a previous batch of tätmjölk would be used to provide the bacteria containing starter culture. In addition in a time before Louis Pasteur when dairy operations were not carried out under the strict hygiene conditions of today, many of the utensils and storage vessels may already have harboured significant numbers of the bacteria from previous fermentations. So usually tätmjölk could be made without using *Pinguicula* as an inoculant. However, from time to time the fermentation would not work properly and the milk would sour, separate and the resultant material would have an unpleasant taste. Perhaps on such occasions the bacteria lost the plastid DNA and the properties this conferred. It was on these occasions (when the milk was considered to be souring too quickly) that the problems would be remedied by obtaining *Pinguicula* leaves together (presumably) with the accompanying plasmid equipped bacteria. The damp environment in which *Pinguicula vulgaris* grows may also suit the rope forming bacteria and hence the association between the two. The long association between the presence of *Pinguicula vulgaris* in pasture land and unwanted ropiness in milk (ref.5) is probably due to the prevalence of the rope forming organisms in such environments rather than the presence of *Pinguicula*. As a result of this association, *Pinguicula vulgaris* has been wrongly persecuted in areas where dairying is an important part of the farming economy.

Conclusions.

There is no doubt that *Pinguicula* leaves have been used since antiquity to assist in the production of tätmjölk in Scandinavia. *Pinguicula* was not usually essential and was probably used only when no other suitable starter material was available, or when the fermentation had failed to produce the desired result. Occasionally *Drosera* and certain snails would be used instead of *Pinguicula*, though *Pinguicula* seems to have been the most popular inoculant apart from a previous batch of tätmjölk. The role of *Pinguicula* (and the other inoculants) was probably to introduce the bacteria capable of performing the ropy fermentation necessary to produce tätmjölk. Sources of inoculant (other than a previous batch of tätmjölk) were probably used to reintroduce the 'wild' plasmid containing bacteria when problems were encountered using previous batches of tätmjölk. As the industrialisation of farming and food processing developed through increased scientific understanding of the processes involved, then the traditional approaches used such as those used for tätmjölk have been replaced by more reliable methods.

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