Growing African violets: learning from IPPS experiences©

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INTRODUCTION

A new system for growing and caring for African Violets has been developed that overcomes many of the issues encountered by consumers when grown indoors. The inspiration for much of this arose through IPPS conference participation and through its members.

BACKGROUND

African violets have long been a popular houseplant; but their popularity has declined somewhat in recent times. Some people see them as plants their mother or grandmother had and hence is not for them, but more often the reaction is that people have difficulty in growing them.

They are a plant that my mother had a passion for growing, and I have kept at least two varieties going through propagating them from leaves over the last 35 years. Most reference books for consumers date back to that era and there are few current.

They are probably not seen much these days however in Australia for a number of reasons, which include changing trends, poor consumer experience with plants failing to flower, or dying soon after purchase, and the difficulty that big box hardware and retail nurseries have in managing them. Some of these symptoms are due to poor media leading to dampening off, poor nutrition, and the difficulty consumers have in finding a place to grow them in their home.

Our nursery considered including them in the product mix after the closure of many of our retail nursery customers through stiff competition from "big box" hardware stores and the drought in the early 2000s on the east coast of Australia. We had a large part of our greenhouse benches underutilized and needed to find new markets.

The genus *Saintpaulia* was named after Baron Walter von Saint Paul-Illaire who discovered them in 1892 on the tropical floor of what is now Tanzania and reported his finding. Species grow in the leaf mulch of rocky crevices and forest floor. Now there are nine recognized species, eight sub-species and two varieties recognized. There are a huge number of hybrid cultivars commercially available around the world in a range of forms from miniatures through standard cultivars and trailing forms.

DISCUSSION

The main characteristics of the natural growing environment that we should try to replicate indoors are: filtered light, high humidity without drafts, warmth with temperatures around 18 to 27°C, moist open free draining soil. These plants have been successfully grown around the world indoors as many of us like to live in an environment similar to their growing requirements.

They are mainly propagated commercially by leaf cuttings and tissue culture. Leaf cuttings develop roots in 2 to 3 weeks, and plantlets within 6 to 8 weeks. These are divided to a single crown and transplanted with smaller sections placed back in propagation trays for planting later on. The first flush of plants is typically ready in 24 to 26 weeks, but flowering may take up to another 6 weeks.

Temperature and humidity

Temperatures above 15°C and a relative humidity of at least 50% is commonly found

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inside homes. We warm our homes in cooler months and mostly avoid drafts. The main growing conditions that we need to meet then are irrigation, light, and the medium.

Irrigation

In 2001 at the IPPS Canberra conference I was introduced to a new mechanical automated capillary irrigation system for greenhouse benches. It was there that I heard Ben Stocks (2001) talk about his capillary watering bench system and met Jim Fahr the inventor of the AutoPot™ hydroponics system Smart Valve® that incorporates a wet dry cycle. Discussion with Ben Stocks and a subsequent visit to Stocks Native Nursery at Harden convinced me that the system would be able to provide what I was after; a reliable capillary system that would operate automatically and reliably with little maintenance attention as long as a good water filtration system and 10 psi low pressure regulator were being used.

A number of benches were constructed with this capillary rise and fall bottom-up watering system. The system uses a geotextile as the capillary bench surface and wick; this is covered by weed-mat. Pots used on the benches must be suited to capillary irrigation. Occasional hand watering from above is necessary to flush dissolved salts depositing on the top of the pine bark media surface.

By about 2008 we had about 40 m^2 of such benches under-utilised, so we looked for alternative plants and markets that suited our greenhouse infrastructure. Fortunately this opportunity has enabled us to develop a more versatile easy care form of indoor flowering pot plant.

Light

Back in 2000 there appeared to be little effective advice to growers from shade cloth distributors or in technical literature as to which grade of their products were appropriate for a given mix of plants. Using advice at the time we installed 75% shade moveable composite screens to maximise growth and reduce transpiration losses of young plants. It was in 2008 that we found from trial that we could grow *Saintpaulia* on our capillary benches under this amount of shade. Our only light meter at the time measured lux with a limited maximum range (more suited to indoor lighting). At the time we did not know of any research or guide for the optimum intensity of light required by any particular species of plant.

Paul Fisher (2014) presented graphs for average daily light integral (DLI) for various months of the year in New Zealand at the 2014 Wellington IPPS conference. This concept attempts to define the average amount of light plants need over a day for optimum growth. He mentioned that the Australian Bureau of meteorology had data that could be used to generate similar graphs for Australia.

These were interpreted and first published by myself in the Australian Region's The Propagator Spring 2014 newsletter. The Bureau of Meteorology data available online is presented as average irradiance in units of MJ m^{-2} d^{-1} which can be readily converted to photosynthetically active radiation (PAR) units of moles m^{-2} d^{-1} by multiplying by 2.01. DLI light intensity values for optimum growth have been available for over 10 years for a range of ornamental plants. For African violets too much light stunts plants and bleaches the leaves, while too little light leads to leggy plants (Figure 1).

Quantum meters can be readily purchased that measure light over a period and integrate this to give DLI figures directly, or you can purchase a less expensive lux meter and apply a conversion factor, or even use measurements using light meter apps available for most commonly available smartphones and converting these to PAR units. This is accomplished by recording light readings where the plants are growing every 30 min. over a day. Convert the readings into the average quantity of PAR light in μmol m^{-2} s^{-1}. For each column (e.g., full sun, greenhouse bench) multiply the per second figure by the number of seconds between readings (1800 for 30 min. gap) and sum the result in the column and divide by 1,000,000 to get the DLI PAR daily moles m^{-2}. For example if our 30-min. daylight readings from 8 a.m. to 4 p.m. in Tasmania in winter in lux were: 0, 2,700, 5,400, 7,500, 7,500, 8,300, 9,700, 10,200, 10,700, 10,200, 9,300, 8,000, 6,400, 5,300, 4,200, 2,700, and 0.

Divide each by 10.76 and multiply by 0.2 to arrive at average PAR units. Multiply by the number of seconds in the time gap between each measurement (1,800 s for each of 30 min. in this example) and add all the resultant numbers and divide by 1,000,000 to get 3.6 mol per day (try this and see if you get this result). From J.E. Faust (2011) in the Ball Red Book, *Saintpaulia* require an average DLI of from 6 to 10 mol m^{-2} day^{-1}.

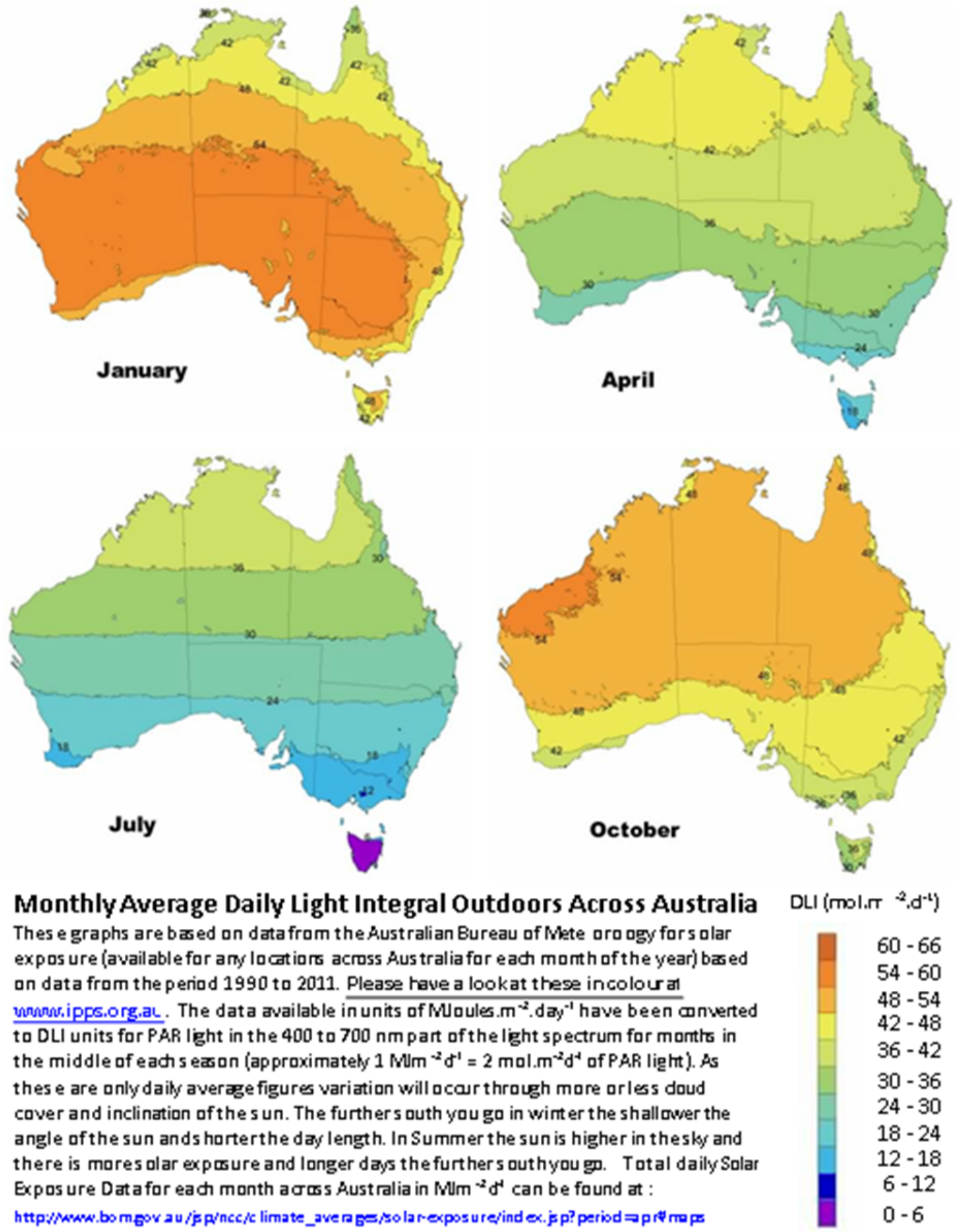

Figure 1. Monthly average daily light integral outdoors across Australia.

In order to assist consumers locate the best places to grow these plants we are suggesting that they try to measure the light intensity at the best lit times at locations with values from 5,000 to 30,000 lux as a guide.

The paper "Coloured LED lighting in propagation" delivered by Karen Brock at the 2013 Melbourne combined IPPS NGIV conference (Editor's note: paper not published) has also inspired our exploration of LED lights for subsidiary lighting options for consumers. At present we do not have any results to report on.

Although more work is required to determine optimum DLI values for a number of Australian ornamental species, this approach not only allows you to select appropriate shade screening for the species grown, but also provides a means of determining how much supplemental lighting may be needed in winter months. It also assists site selection for low light or high light requirement species. Optimum DLI figures may also vary at different times of the year. The information may also be used to give consumers a guide for example in locating the best location for indoor plants.

Media

Historically African violets were grown in medium comprised of peat moss and perlite and a wick was used to limit the water capillary rise. This approach often necessitated the use of special pots with a water reservoir at the base into which the wick sat. More recently medium available and typically used is comprised of either relatively fine composted pine bark or coco peat or a mix of these which have a high water holding capacity and present a management issue of restricting the amount of water provided whilst not allowing the medium to completely dry. Fastidious consumers need to monitor their plants on almost a daily basis in order to minimize plant loss through fungal diseases such as dampening-off.

We decided that this was unacceptable and set out to match the results achieved with the wick system but without a wick and with medium based mainly on grades of readily available composted pine bark.

Initial medium trials comprised of varying amounts of perlite, peat moss, and different screened grades of composted pine bark were unsuccessful (plants did not survive more than 3 months on the capillary benches due to dampening-off or insufficient capillary rise). A range of commercial African violet mixes were also trialed as well as an open medium grade orchid mix and native potting mix. The medium orchid mix proved to give an acceptable result after slight modification to improve wettability after drying out. Mix was ordered in pallet lots unfortunately after several years supply the mix changed and we urgently looked for a replacement. A multi-factorial experimental design resulted in an open course mix with low fines and sufficient capillary rise. This mix has an AFP of 37% and typical pH of 6, and has proven itself now with over 2-years commercial growing experience. Using this system consumers are able to now reliably grow their plants in a range of commercially available “self watering” pots as well as ones with a saucer. The approach has also enabled mixed plantings in a single container with minimal care.

Nutrition

At the 2006 Brisbane IPPS Conference John Hall (our key note speaker) presented a case for providing nutrition matching the leaf tissue analysis of plants (Editor’s note: paper not published). This approach has been used for many years now for hydroponically grown fruits and vegetables. After some research we found that NPK and sometimes micronutrient data from leaf tissue elemental analysis results were available for many types of plants or could be derived from published results.

This was also certainly the case with *Saintpaulia* where Chen and Henny (2015) had determined values of nutrients for optimum growth and nitrogen requirement. Conversion of the values into what to look for in a controlled release fertilizer resulted in a typical percentage composition of 16N:1.3P:18K to 16N:4P:24K for which we chose to use a 9-month, slow-release native fertilizer.

The other critical factor in determining dosage is the nitrogen demand for the plant species according to a method outlined in the text “Growing Media for Ornamental Plants and Turf” by Handreck and Black (2002). We adopted this using controlled release fertilisers for a wide range of plants so we looked for data for *Saintpaulia*. It had however been found that a revised formula was needed to determine the quantity of fertilizer used.

- $F = N \times t / (FN \times 10)$ g plant^{-1} (pot)
    - o 1 g L^{-1} = 1 kg m^{-3} of mix
    - o For established (larger) garden plants use about 10 times this

- F is the quantity of fertiliser (g per plant-pot)
- N is the nitrogen requirement of a plant (mg week^{-1})
- t is the estimated duration of fertiliser in weeks—for CRF use 2/3 of claimed life and t = 1 for weekly liquid fertilizer, e.g., in this case commercial "African violet food"
- FN is the percent nitrogen in the fertiliser

African violets have a low nitrogen demand resulting in a dosage of 4 g (1/2 teaspoon per plant). Simulations using suppliers release rate data with typical indoors growing temperatures in the south eastern states of Australia indicated that such fertilizers could last up to 1 year in practice before refertilising plants. This has also contributed to the long flowering and easy care reputation of these plants.

CONCLUSION

A system has been developed allowing African violets to be grown with minimal care by consumers, and resulting in healthier indoor plants. Many of the advances were achieved through knowledge gained from IPPS conferences and members. Many of the concepts should be able to be adapted and applied to improve the growth of many other types of plants. This is important in an ever changing world where the marketplace is in constant change through the impact of internet sales and marketing.

Literature cited

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