Hibiscus International

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PRESIDENTS REPORT

SPECIAL POINTS OF INTEREST:

INSIDE THIS ISSUE:

Once again another year has flown by so quickly and we stand at the start of a whole new year. On behalf of the members of the board of directors we hope that your holiday season was spent in the warm embrace of your family and friends and that the holidays were filled with all you hold dear.

We have made it through yet another year and now look forward to the work that lies ahead. The coming year will more than likely present us with many challenges, some of which that might seem insurmountable, but if can pool the considerable talent that exists in our large and ever expanding family, I am sure we will find solutions to whatever challenges we face.

But perhaps the greatest challenge we face as an organization is people. We have a worldwide membership of many hundreds of people but the ongoing day-to-day operation of the society falls to a mere handful of volunteers. Without these dedicated volunteers the society would cease to function and perhaps even disappear.

This might seem like an opportune time to mention these dedicated people by name but I fear to do so as I may overlook someone. They know who they are and to each and every one of them we all owe an enormous debt of gratitude. However, we are at a point in our history when we can no longer expect a few people to do all the work. Our two most important areas of concern—nomenclature and web development are being undertaken by one person with some assistance from others.

Both these tasks are crucial to our future and we have to come to the realization that we have grown to such an extent that we may be unable to provide the services to the hibiscus community around the world without professional help. At the very least we have to

agree that no one person has the time to deal with these issues on a daily basis and still have some semblance of a home life. If we do nothing then the inevitable will happen—burnout. When the few volunteers that toil tirelessly feel they can no longer give of themselves any longer, we will be facing a major crisis to which we may not be able to respond.

We need to plan for the future now so that we are prepared for the inevitable challenges ahead. We need to determine if we require professional help in developing our website which is beyond the capacity of one person to maintain. Some of these decisions will be difficult and perhaps even expensive but I don't feel that ignoring them is an option.

Any thoughts or suggestions can be directed to any member of the board of directors to be discussed. We need your input, so please help us and become involved.

EDITORS REPORT

This edition of Hibiscus International is somewhat unique in that the entire issue is composed of one article entitled "Temperature, Humidity and Light" written by Alan de la Torre and his wife Vera. As is usual with Alan and Vera's articles, it is an in-depth study of the relationship of temperature, humidity and light and how these factors influence growing hibiscus.

This article should be read more than once by anyone interested in improving the growth of their hibiscus. When one understands how these three factors interact with one another, you develop a deeper understanding and appreciation of how they influence the growth and blooming of your hibiscus.

Happy hibiscus growing!

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I.H.S. PATRON— DAVID FRANZMAN

TEMPERATURE, HUMIDITY & LIGHT

Alan & Vera De La Torre

There are times when hibiscus wilts because of fungal or bacterial disease. But there are also times when hibiscus wilts during the day and rejuvenates at night. This kind of wilting has nothing to do with fungi or bacteria. It is caused by change in climate such as when the temperature rises, or when humidity drops. At first we had little interest in the subject because we had other priorities like controlling insects. We became interested when we observed that at certain times of the year our plants were not as healthy as they should be. We realized that it is not enough to give fertilizer, or make sure insects are under control. The climate they live in is also important. Harsh climate can expose hibiscus to unnecessary stress and inhibit luscious dark green foliage and beautiful blooms.

When we started propagating hibiscus, our understanding of an ideal climate was limited to a rule of thumb: that hibiscus prefers a temperature range of 72°F to 82°F (22 ° C to 28°C) and a relative humidity of 70% to 80%. It sounded simple and straightforward. Yet, when temperature was within the desired range but plants were not blooming, we wondered what happened to the rule. When plants produced blooms although temperature was above 86°F (30°C), we begun to wonder if those numbers actually mean anything.

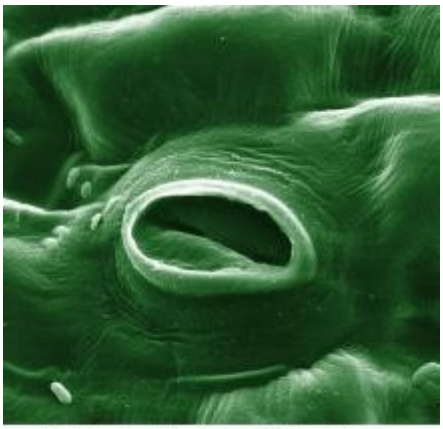
If you take daily readings of temperature and humidity, the numbers can be confusing. Temperature changes everyday—sometimes within range, sometimes out of range. With numbers going up and down and changing constantly, it is hard to tell how it affects hibiscus.

As for humidity, we realized it is not constant throughout our farm. Certain locations are dry; certain locations are wet. There are areas where humidity is <60%, and there are also areas where it is >75%. As air changes inside our greenhouse, humidity changes as well. The numbers do not seem to tell us anything; and it is hard to infer any conclusion that makes sense of the rule of thumb.

What we did not realize until much later is that temperature alone or humidity alone shows us only one side of the coin. But when taken together, they can help us understand how climate affects hibiscus. In this article, we would like to share how temperature in conjunction with humidity influences the growth of hibiscus.

Transpiration

We know that plants naturally transpire water vapor into the atmosphere through the stomata or openings (right) found in their leaves, stems and even flowers. We may not see the water vapor coming out, but if we cover a plant with transparent humidity bag as we do with rooted cuttings, condensation occurs in just a matter of days.



Retrived online from Wikipedia.org

The rate of transpiration or the volume of water that hibiscus exudes depends on temperature and humidity. When temperature is high and humidity is low, hibiscus will lose a lot of water. Even if its water level runs low, it will continue to transpire until it is dehydrated. The first to show signs of stress are the leaves that wilt like a thin fabric. Water makes the leaves and stem rigid and firm, so the absence or low supply of water will show the contrary.

The rate at which hibiscus loses water through the leaves is greater than the roots' capacity to replenish the plant's supply of water. This explains why under extreme conditions hibiscus wilts during the day and rejuvenates at night. To exemplify this process, we took one brave soul and placed it under high temp, low humidity condition and deprived it of water. Within days the plant wilted (left). Then we took the plant under shade and gave it water and the leaves were upright again (right).

Dehydrated

Rehydrated

[1] To be more accurate, it is the osmotic pressure of water that makes the leaves and stem rigid and firm.

Vapor Pressure Deficit (VPD)

What causes plants to transpire is not temperature alone or humidity alone but the combination of both variables. This is usually expressed in terms of vapor pressure deficit (VPD). Let's take a step backward and explain VPD.

According to Elly Nederhoff (2004), warm air can hold more water than cool air. When air of a certain temperature is saturated with water, it is called 100% relative humidity. For example, at 68°F (20°C) it takes 17.3 grams of water vapor per cubic meter of air to reach 100% relative humidity. But at 86°F (30°C) it takes 30.4 grams of water vapor to reach 100% relative humidity. So if temperature rises from 68°F to 86°F while humidity remains at 17.3 grams, relative humidity is 57% only of its saturation point. For this reason, humidity is said to be *relative* because the saturation point is different from one temperature to another. The difference between the saturation point and relative humidity is the deficit in vapor pressure. This deficit (or VPD) is a persistent sucker of water vapor. If the deficit is low, less water will be drawn from plants. But if the deficit is high, more water will be drawn, and there is almost nothing plants can do but show signs of stress, such as in the case of *Masked Bandit* (above) where the leaves are calling out for help.

How to Apply VPD

To put this into practice, we attached a table at the end of this article which shows the VPD values for specific temperature and humidity levels. In this table, VPD is expressed in kilopascal (kPa). If you know the temperature and humidity in your area, you can check the VPD value using the table. For example, at 84°F (29°C) with relative humidity of 60%, VPD is 1.60 kilopascals. This is very high for hibiscus.

The ideal growing range for most plants including hibiscus is 0.80 to 0.95 kPa. We consider this range *ideal* because bloom sizes are correct, petals are true to form, colors are exactly what it should be, foliage are lusciously dark green, stems and leaves are rigid, pollens are dehisced, and pollinations take off. Above 0.95 kPa to 1.25 kPa, air is warm yet almost all varieties perform very well, sometimes even at its best, although on occasions some may not possess all of the characteristics mentioned above. On the other hand, at 0.80 kPa down to 0.50 kPa, moisture is high and air is cool; somehow vegetative growth is slower, but hibiscus can thrive very well. We consider these upper and lower ranges *tolerable*.

< 0.50 kPa	0.50 – < 0.80	0.80 – 0.95	> 0.95 – 1.25	> 1.25 kPa
(Wet/Cold)		*(Ideal)*		*(Hot/Dry)*

We experience problems when VPD is consistently over 1.25 kPa for several weeks especially when it approaches 1.5 kPa. At this range leaves are thin and dry; seedpods do not take off; some blooms do not dehisced pollens, and some varieties hardly bloom or bloom infrequently. At this range, we usually add another layer of shading net.

In high VPD, hibiscus may show imperfections like foliage is no longer dark green, infrequent blooms, blooms that do not dehisced pollens, and sometimes undersized leaves. When this happens it is not advisable to force plants to bloom. We need to understand that the climate is out of range and plants are under stress. But this is not to say that all varieties are not capable of blooming at high VPD. Some varieties are tolerant including this seedling (right), which we named *Tahitian Viceroy* that bloomed when VPD was 1.57 kPa. The size is still the same, the form is still perfect, but the color is lighter. This tells us that while some varieties reach their threshold at a certain point, some varieties are still resilient albeit with a few imperfections. The threshold seems to vary from one variety to another. It is possible that summer bloomers are those resilient to high VPD, while year-round bloomers are those that are resilient to both high and low VPD.

Effects of VPD and Light on Photosynthesis

Photosynthesis is integral to food-production in plants, which are *autotrophs* (generates its own food), and not *heterotrophs* (consumes living matter for food). One key ingredient in photosynthesis is carbon dioxide which is absorbed by plants through the stomata during transpiration. But just as VPD affects transpiration, it also affects photosynthesis.

Y. Zhang et al. (1995) reported that the rate of photosynthesis in hibiscus rosa-sinensis (or the rate hibiscus generates food) when VPD is 1.5 kPa is 50% only of what it normally produces at 0.8 kPa. So at high VPD, we can imagine hibiscus on a low diet. But what's worse is that at 2.5 kPa hibiscus rosa-sinensis is in so much stress that the stomata close every 30+ minutes to prevent dehydration.

Sunlight which provides energy to plants also has an effect on photosynthesis. S. V. Archontoulis et al. (2005) reported that different levels of light influence photosynthesis in hibiscus cannabinus (Kenaf). They reported that the rate of photosynthesis accelerated in relation to light from 0 to 92,000 lux[3]. Light density is expressed in lux,

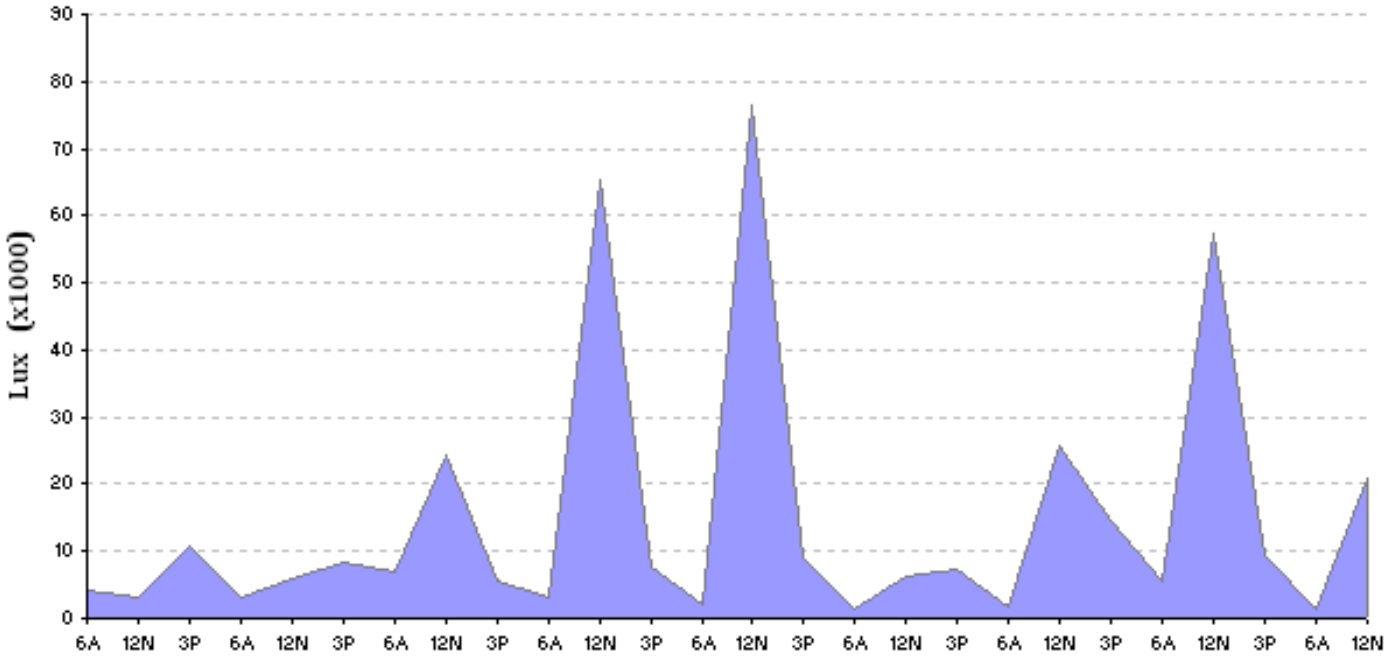
[1] Tahitian Viceroy (Tahitian Sensation x Tahitian Arcturus King) by Richard Johnson, not yet registered.

[2] At all levels of light not exceeding 30,000 lux (approx. 2,800 foot-candles)

[3] 92,000 lux is equivalent to 8,550 foot-candles (US) or 1700 PAR (for those using grow lights).

where 15,000 - 25,000 lux is considered as *low light*; 25,000 - 40,000 lux is considered as *medium light*; and 40,000 - 60,000 lux is considered as *bright light*. A full sun can exceed 100,000 lux.

Light stimulates stomatal opening (Christopher Michael Gough, 2000), which means that when plants transpire photosynthesis is at work. But bright light in combination with high VPD can be detrimental to hibiscus. For this reason, we use shading nets when VPD is high to give plants medium light. The intensity of light coming from the sun is not consistent throughout the day. In July 2012, we took daily readings of light inside our greenhouse at different times of the day and observed a lot of variations.



How to Gauge Light Intensity

If you take a piece of white paper and place your hand 8 inches above it, you can discern the intensity of light by the shadow. In bright light, the sky is clear, the shadow is dark, and the edges of the shadow are discernible. In medium light, the sky is partly cloudy, the shadow is gray, and the edges of the shadow can be blurry. In low light, the sky is cloudy, and the shadow is blurred, sometimes none at all.

Bright Light

Medium Light

Low Light

The length of time that hibiscus is exposed to light is not significantly important when it comes to producing blooms, unlike in other plants. Some plants induce flowers when day length is shorter (short-day plants), while others when day length is longer (long-day plants). For example, amaryllis (*Hippeastrum*) and calla lily (*Zantedeschia*) are sensitive to day length such that the length of time it takes to mature and induce blooms depends on the length of the day. South African amaryllis can bloom in 8 weeks from planting as compared to their Dutch counterparts which takes 10 weeks, sometimes longer. Similarly, Dutch varieties of calla lily can bloom in 8-11 weeks from planting, while the same varieties can bloom in just 4 weeks in our farm. So growers of such plants are concerned with day length. Luckily, hibiscus rosa-sinensis are day-neutral plants, which mean it is not affected by the length of the day or length of the night, according to Christopher J. Currey (2011).

Coping with High/Low VPD

There are ways to help hibiscus cope with VPD but, foremost, we need to find a suitable location where it is not under stress for a long period of time. Plants that are not exposed to prolonged stress can survive even under conditions of neglect. Occasional stress is manageable, but prolonged stress is difficult, time-consuming and expensive to manage.

In high VPD:

We should not forget to water the plants. If they are planted in the ground, water the soil around them so more water will evaporate and cool the air. You can also mulch the soil within the plant's canopy to keep moisture.

We can let them sit with other plants that can help cool the air around them—the more plants, the better; if there are trees and grass, the better.

Keep the plants away from bright light even if they are resilient or cover them with shading net to minimize contact with light. Bright light will increase the rate of transpiration.

If your plants are sitting on concrete floor, mist them occasionally or place, in between plants, plastic cups half-filled with water. Or, if you do not mind, wet the floor so more water will evaporate and cool the air.

If you have a sensitive plant, you can wrap it with humidity bag and keep it under shade. Rooted cuttings and grafts are usually wrapped with humidity bags so that as soon as condensation occurs, transpiration is reduced. This is important to prevent dehydration while roots are still at a formative stage or when the union in grafts is still healing off.

If you have tall bushes, you can prune it or reduce the number of leaves. The fewer the leaves, the less they transpire. This is the reason why it is suggested to prune hibiscus in summer to reduce the amount of transpiration.

[1] Some people argue that it is not the length of the day but the length of the night that actually matters.

Good air circulation is important. Even commercial growers are concerned with the number of air changes inside their greenhouse to keep transpiration under control.

Paint the leaves with anti-transpirant like Wilt-Pruf®. Anti-transpirants are designed to close the stomata for several days to minimize transpiration.

In low VPD:

In winter, move the plants inside the house or in an enclosed area where temperature and humidity are under control.

In tropical climates, a low VPD can mean wet condition. In this case, we need to keep the leaves and stem dry as much as possible.

If VPD is very low (<0.25 kPa), photosynthesis may be inhibited. In this case, you need air circulation or other means to introduce warm air. Warm air can trigger transpiration.

If you're worried of winter-burn, paint the leaves with anti-transpirant like Wilt-Pruf®. This product has a viscous sap that can help prevent dryness for several days and give it a glossy appearance. It is like lip balm that relieves chapped lips. You can apply anti-transpirant by spraying, but we suggest the use of a paintbrush. A 100 ml. concoction (water diluted) can already paint several plants.

High and low VPDs are extremes of the ideal climate for hibiscus. They come with changes in season and are natural. There will be glory days when hibiscus will greet us with multiple blooms. There will also be sorry days when it is void of blooms. These are difficult times for the plants. So instead of forcing it to bloom or restore its dark green foliage, it is better to help the plants cope with stress.

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VAPOR PRESSURE DEFICIT (kPa)

°F Fahrenheit °C Celsius RH Relative Humidity Ideal Tolerable Dry/Hot Wet/Cold

°F	54	55	57	59	61	63	64	66	68	70	72	73	75	77	79	81	82	84	86	88	90	91	93	95	97	99	100	102	104
°C	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
RH																													
100%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
99%	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.06	0.06	0.06	0.07	0.07	0.07
98%	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.06	0.06	0.06	0.07	0.07	0.08	0.08	0.08	0.09	0.10	0.10	0.11	0.11	0.12	0.13	0.13	0.14	0.15
97%	0.04	0.04	0.05	0.05	0.05	0.06	0.06	0.07	0.07	0.07	0.08	0.08	0.09	0.10	0.10	0.11	0.11	0.12	0.13	0.13	0.14	0.15	0.16	0.17	0.18	0.19	0.20	0.21	0.22
96%	0.06	0.06	0.06	0.07	0.07	0.08	0.08	0.09	0.09	0.10	0.11	0.11	0.12	0.13	0.13	0.14	0.15	0.16	0.17	0.18	0.19	0.20	0.21	0.22	0.24	0.25	0.26	0.28	0.29
95%	0.07	0.07	0.08	0.09	0.09	0.10	0.10	0.11	0.12	0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.19	0.20	0.21	0.22	0.24	0.25	0.27	0.28	0.30	0.31	0.33	0.35	0.37
94%	0.08	0.09	0.10	0.10	0.11	0.12	0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.19	0.20	0.21	0.23	0.24	0.25	0.27	0.29	0.30	0.32	0.34	0.36	0.38	0.40	0.42	0.44
93%	0.10	0.10	0.11	0.12	0.13	0.14	0.14	0.15	0.16	0.17	0.19	0.20	0.21	0.22	0.24	0.25	0.26	0.28	0.30	0.31	0.33	0.35	0.37	0.39	0.42	0.44	0.46	0.49	0.52
92%	0.11	0.12	0.13	0.14	0.15	0.15	0.17	0.18	0.19	0.20	0.21	0.22	0.24	0.25	0.27	0.29	0.30	0.32	0.34	0.36	0.38	0.40	0.43	0.45	0.48	0.50	0.53	0.56	0.59
91%	0.13	0.13	0.14	0.15	0.16	0.17	0.19	0.20	0.21	0.22	0.24	0.25	0.27	0.29	0.30	0.32	0.34	0.36	0.38	0.40	0.43	0.45	0.48	0.51	0.53	0.56	0.60	0.63	0.66
90%	0.14	0.15	0.16	0.17	0.18	0.19	0.21	0.22	0.23	0.25	0.26	0.28	0.30	0.32	0.34	0.36	0.38	0.40	0.42	0.45	0.48	0.50	0.53	0.56	0.59	0.63	0.66	0.70	0.74
89%	0.15	0.16	0.18	0.19	0.20	0.21	0.23	0.24	0.26	0.27	0.29	0.31	0.33	0.35	0.37	0.39	0.42	0.44	0.47	0.49	0.52	0.55	0.58	0.62	0.65	0.69	0.73	0.77	0.81
88%	0.17	0.18	0.19	0.20	0.22	0.23	0.25	0.26	0.28	0.30	0.32	0.34	0.36	0.38	0.40	0.43	0.45	0.48	0.51	0.54	0.57	0.60	0.64	0.67	0.71	0.75	0.79	0.84	0.88
87%	0.18	0.19	0.21	0.22	0.24	0.25	0.27	0.29	0.30	0.32	0.34	0.37	0.39	0.41	0.44	0.46	0.49	0.52	0.55	0.58	0.62	0.65	0.69	0.73	0.77	0.82	0.86	0.91	0.96
86%	0.20	0.21	0.22	0.24	0.25	0.27	0.29	0.31	0.33	0.35	0.37	0.39	0.42	0.44	0.47	0.50	0.53	0.56	0.59	0.63	0.67	0.70	0.74	0.79	0.83	0.88	0.93	0.98	1.03
85%	0.21	0.22	0.24	0.26	0.27	0.29	0.31	0.33	0.35	0.37	0.40	0.42	0.45	0.48	0.50	0.53	0.57	0.60	0.64	0.67	0.71	0.75	0.80	0.84	0.89	0.94	0.99	1.05	1.11
84%	0.22	0.24	0.26	0.27	0.29	0.31	0.33	0.35	0.37	0.40	0.42	0.45	0.48	0.51	0.54	0.57	0.60	0.64	0.68	0.72	0.76	0.80	0.85	0.90	0.95	1.00	1.06	1.12	1.18
83%	0.24	0.25	0.27	0.29	0.31	0.33	0.35	0.37	0.40	0.42	0.45	0.48	0.51	0.54	0.57	0.61	0.64	0.68	0.72	0.76	0.81	0.85	0.90	0.96	1.01	1.07	1.13	1.19	1.25
82%	0.25	0.27	0.29	0.31	0.33	0.35	0.37	0.40	0.42	0.45	0.48	0.51	0.54	0.57	0.60	0.64	0.68	0.72	0.76	0.81	0.86	0.91	0.96	1.01	1.07	1.13	1.19	1.26	1.33
81%	0.27	0.28	0.30	0.32	0.35	0.37	0.39	0.42	0.44	0.47	0.50	0.53	0.57	0.60	0.64	0.68	0.72	0.76	0.81	0.85	0.90	0.96	1.01	1.07	1.13	1.19	1.26	1.33	1.40
80%	0.28	0.30	0.32	0.34	0.36	0.39	0.41	0.44	0.47	0.50	0.53	0.56	0.60	0.63	0.67	0.71	0.76	0.80	0.85	0.90	0.95	1.01	1.06	1.12	1.19	1.25	1.32	1.40	1.47
79%	0.29	0.31	0.34	0.36	0.38	0.41	0.43	0.46	0.49	0.52	0.56	0.59	0.63	0.67	0.71	0.75	0.79	0.84	0.89	0.94	1.00	1.06	1.12	1.18	1.25	1.32	1.39	1.47	1.55
78%	0.31	0.33	0.35	0.38	0.40	0.43	0.45	0.48	0.51	0.55	0.58	0.62	0.66	0.70	0.74	0.78	0.83	0.88	0.93	0.99	1.05	1.11	1.17	1.24	1.31	1.38	1.46	1.54	1.62
77%	0.32	0.34	0.37	0.39	0.42	0.45	0.47	0.51	0.54	0.57	0.61	0.65	0.69	0.73	0.77	0.82	0.87	0.92	0.98	1.03	1.09	1.16	1.22	1.29	1.37	1.44	1.52	1.61	1.70
76%	0.34	0.36	0.38	0.41	0.44	0.46	0.50	0.53	0.56	0.60	0.63	0.67	0.72	0.76	0.81	0.86	0.91	0.96	1.02	1.08	1.14	1.21	1.28	1.35	1.43	1.51	1.59	1.68	1.77
75%	0.35	0.37	0.40	0.43	0.45	0.48	0.52	0.55	0.58	0.62	0.66	0.70	0.75	0.79	0.84	0.89	0.94	1.00	1.06	1.12	1.19	1.26	1.33	1.41	1.48	1.57	1.66	1.75	1.84
74%	0.36	0.39	0.42	0.44	0.47	0.50	0.54	0.57	0.61	0.65	0.69	0.73	0.78	0.82	0.87	0.93	0.98	1.04	1.10	1.17	1.24	1.31	1.38	1.46	1.54	1.63	1.72	1.82	1.92
73%	0.38	0.40	0.43	0.46	0.49	0.52	0.56	0.59	0.63	0.67	0.71	0.76	0.81	0.86	0.91	0.96	1.02	1.08	1.15	1.21	1.28	1.36	1.44	1.52	1.60	1.69	1.79	1.89	1.99
72%	0.39	0.42	0.45	0.48	0.51	0.54	0.58	0.62	0.65	0.70	0.74	0.79	0.84	0.89	0.94	1.00	1.06	1.12	1.19	1.26	1.33	1.41	1.49	1.57	1.66	1.76	1.85	1.96	2.06

VAPOR PRESSURE DEFICIT (kPa)

°F Fahrenheit °C Celsius RH Relative Humidity Ideal Tolerable Dry/Hot Wet/Cold

°F	54	55	57	59	61	63	64	66	68	70	72	73	75	77	79	81	82	84	86	88	90	91	93	95	97	99	100	102	104
°C	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
RH																													
71%	0.41	0.43	0.46	0.49	0.53	0.56	0.60	0.64	0.68	0.72	0.77	0.81	0.87	0.92	0.97	1.03	1.10	1.16	1.23	1.30	1.38	1.46	1.54	1.63	1.72	1.82	1.92	2.03	2.14
70%	0.42	0.45	0.48	0.51	0.55	0.58	0.62	0.66	0.70	0.75	0.79	0.84	0.89	0.95	1.01	1.07	1.13	1.20	1.27	1.35	1.43	1.51	1.60	1.69	1.78	1.88	1.99	2.10	2.21
69%	0.43	0.46	0.50	0.53	0.56	0.60	0.64	0.68	0.72	0.77	0.82	0.87	0.92	0.98	1.04	1.11	1.17	1.24	1.32	1.39	1.47	1.56	1.65	1.74	1.84	1.94	2.05	2.17	2.29
68%	0.45	0.48	0.51	0.55	0.58	0.62	0.66	0.70	0.75	0.80	0.85	0.90	0.95	1.01	1.08	1.14	1.21	1.28	1.36	1.44	1.52	1.61	1.70	1.80	1.90	2.01	2.12	2.24	2.36
67%	0.46	0.49	0.53	0.56	0.60	0.64	0.68	0.72	0.77	0.82	0.87	0.93	0.98	1.05	1.11	1.18	1.25	1.32	1.40	1.48	1.57	1.66	1.75	1.86	1.96	2.07	2.19	2.31	2.43
66%	0.48	0.51	0.54	0.58	0.62	0.66	0.70	0.75	0.79	0.85	0.90	0.96	1.01	1.08	1.14	1.21	1.28	1.36	1.44	1.53	1.62	1.71	1.81	1.91	2.02	2.13	2.25	2.38	2.51
65%	0.49	0.52	0.56	0.60	0.64	0.68	0.72	0.77	0.82	0.87	0.93	0.98	1.04	1.11	1.18	1.25	1.32	1.40	1.48	1.57	1.66	1.76	1.86	1.97	2.08	2.20	2.32	2.45	2.58
64%	0.50	0.54	0.58	0.61	0.65	0.70	0.74	0.79	0.84	0.90	0.95	1.01	1.07	1.14	1.21	1.28	1.36	1.44	1.53	1.62	1.71	1.81	1.91	2.02	2.14	2.26	2.38	2.52	2.65
63%	0.52	0.55	0.59	0.63	0.67	0.72	0.76	0.81	0.86	0.92	0.98	1.04	1.10	1.17	1.24	1.32	1.40	1.48	1.57	1.66	1.76	1.86	1.97	2.08	2.20	2.32	2.45	2.59	2.73
62%	0.53	0.57	0.61	0.65	0.69	0.74	0.78	0.83	0.89	0.94	1.00	1.07	1.13	1.20	1.28	1.35	1.44	1.52	1.61	1.71	1.81	1.91	2.02	2.14	2.26	2.38	2.52	2.66	2.80
61%	0.55	0.58	0.62	0.66	0.71	0.76	0.80	0.86	0.91	0.97	1.03	1.10	1.16	1.24	1.31	1.39	1.47	1.56	1.65	1.75	1.85	1.96	2.07	2.19	2.32	2.45	2.58	2.73	2.88
60%	0.56	0.60	0.64	0.68	0.73	0.77	0.83	0.88	0.94	0.99	1.06	1.12	1.19	1.27	1.34	1.43	1.51	1.60	1.70	1.80	1.90	2.01	2.13	2.25	2.38	2.51	2.65	2.80	2.95
59%	0.57	0.61	0.66	0.70	0.75	0.79	0.85	0.90	0.96	1.02	1.08	1.15	1.22	1.30	1.38	1.46	1.55	1.64	1.74	1.84	1.95	2.06	2.18	2.30	2.44	2.57	2.72	2.87	3.02
58%	0.59	0.63	0.67	0.72	0.76	0.81	0.87	0.92	0.98	1.04	1.11	1.18	1.25	1.33	1.41	1.50	1.59	1.68	1.78	1.89	2.00	2.11	2.23	2.36	2.49	2.63	2.78	2.94	3.10
57%	0.60	0.64	0.69	0.73	0.78	0.83	0.89	0.94	1.01	1.07	1.14	1.21	1.28	1.36	1.45	1.53	1.62	1.72	1.82	1.93	2.04	2.16	2.29	2.42	2.55	2.70	2.85	3.01	3.17
56%	0.62	0.66	0.70	0.75	0.80	0.85	0.91	0.97	1.03	1.09	1.16	1.24	1.31	1.39	1.48	1.57	1.66	1.76	1.87	1.98	2.09	2.21	2.34	2.47	2.61	2.76	2.91	3.08	3.24
55%	0.63	0.67	0.72	0.77	0.82	0.87	0.93	0.99	1.05	1.12	1.19	1.26	1.34	1.43	1.51	1.60	1.70	1.80	1.91	2.02	2.14	2.26	2.39	2.53	2.67	2.82	2.98	3.15	3.32
54%	0.65	0.69	0.74	0.78	0.84	0.89	0.95	1.01	1.08	1.14	1.22	1.29	1.37	1.46	1.55	1.64	1.74	1.84	1.95	2.07	2.19	2.31	2.45	2.59	2.73	2.89	3.05	3.22	3.39
53%	0.66	0.70	0.75	0.80	0.85	0.91	0.97	1.03	1.10	1.17	1.24	1.32	1.40	1.49	1.58	1.68	1.78	1.88	1.99	2.11	2.23	2.36	2.50	2.64	2.79	2.95	3.11	3.29	3.47
52%	0.67	0.72	0.77	0.82	0.87	0.93	0.99	1.05	1.12	1.19	1.27	1.35	1.43	1.52	1.61	1.71	1.81	1.92	2.04	2.16	2.28	2.41	2.55	2.70	2.85	3.01	3.18	3.36	3.54
51%	0.69	0.73	0.78	0.84	0.89	0.95	1.01	1.08	1.15	1.22	1.30	1.38	1.46	1.55	1.65	1.75	1.85	1.96	2.08	2.20	2.33	2.46	2.61	2.75	2.91	3.07	3.25	3.42	3.61
50%	0.70	0.75	0.80	0.85	0.91	0.97	1.03	1.10	1.17	1.24	1.32	1.40	1.49	1.58	1.68	1.78	1.89	2.00	2.12	2.25	2.38	2.51	2.66	2.81	2.97	3.14	3.31	3.49	3.69

Formula Reference: Murray, F. W., On the Computation of Saturation Vapor Pressure, J. Appl. Meteorol., 6, 203-204, 1967.

IHS Seedbank

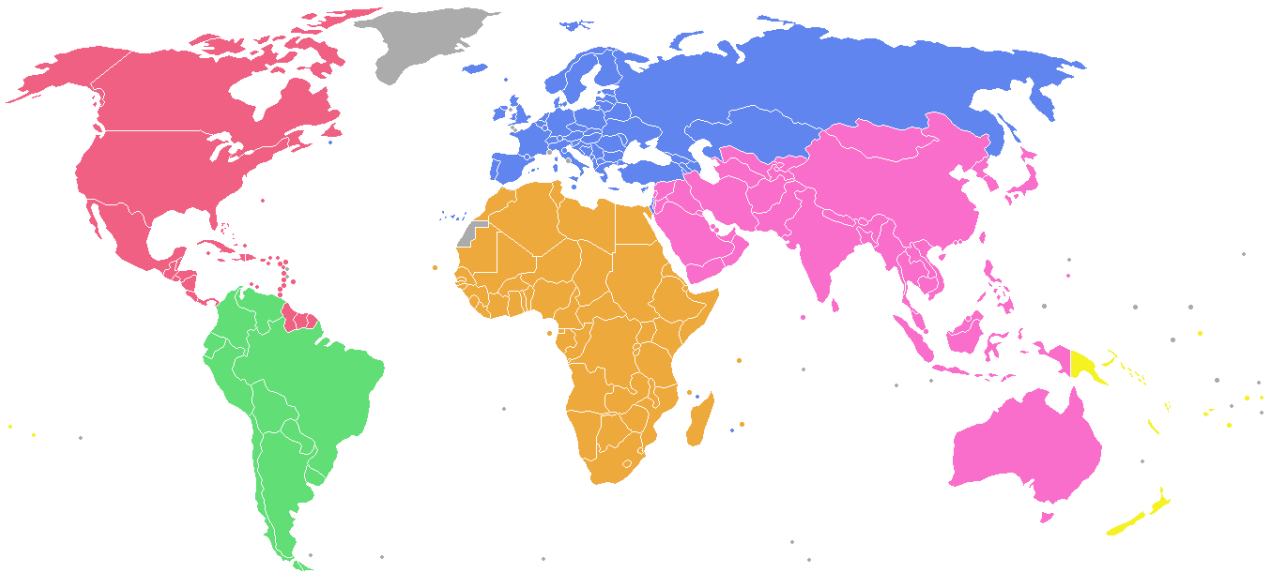
Annual Report 2012

-submitted by the Seed Bank Officer, Peter Moll

During 2012, I distributed 851 seeds to 82 hibiscus lovers in 30 countries all over the world. German hibiscus lovers were again on the top of the list, with 16 requests, followed by 12 from the U.S. and seven from Poland, just mentioning the most important destinations. From all other countries I got four or less requests.

From March 2012 onwards, you have sent me 444 seeds of known parents, (plus some seeds of unknown parents) from Ian, 230 seeds from Beth and 120 seeds from Sonny, totalizing 794 seeds. The remainder were seeds from my crosses.
As the seed stock is at zero again, I ask you to send me fresh seeds for the 2013 campaign within the very next weeks.

As the seed stock is at zero again, I ask you to send me fresh seeds for the 2013 campaign within the very next weeks. Anyone with spare seeds that they wish to contribute to the seed bank can send them directly to: Peter Moll, Caixa Postal 06, 12260-000 Paraibuns/SP, Brazil. Any number of seeds whether large or small is deeply appreciated.



High Voltage

Belle Du Jour

Bon Temps

Cindy's Heart

Red Voltage

T Chantal Mon Amour

Plum Pizzazz

Fallen Hero

Tahitian Queen

Gypsy Bride

Charm Glow

In Your Dreams

First Impression