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Ökophysiologische Untersuchungen an *Commersonia bartramia* im Hinblick auf ihre Bedeutung für Maßnahmen der Landrehabilitierung auf Leyte, Philippinen

Diplomarbeit
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Abstact (english)

1. Introduction

Due to poverty, Population pressure, because of commercial felling and lack of available country for agricultural production on the Philippines, the forest stands dramatically sunk. The island Leyte can thereby exemplary be consulted for excessive resources use and degradation of areas. Large areas are covered by degraded lea and unproductive Coconut plantations. In this way serious ecological and sozio economic consequences arise.

In order to protect already degraded areas against fire and to recirculate them to use, afforestation and Agro- Forest- Systems are propagated.

The establishment of such a system is interfered through the grass- vegetation of the degraded areas, frequently *Imperata cylindrica*, because there, the microclimate and the competition conditions for other species are very unfavorable. *I. cylindrica* can however be controlled by shading through tree plantations. In a first step it is important to create a mircoclimate that makes the establishment of valuable primary forest tree species possible. In this case pioneer tree species has to be conisidered, because they naturally establish and colonize open habitats.

In this work it is to be clarified whether *C. bartrmia* as a new pioneer tree species can be used in such a system. Therefor the ability to create a suitable microclimate where unproductive grassland can not survive, however for productive species a suitable climate prevails, needs to be aquired. Additionally the conditions for a controlled germination and for raising them in tree plantations ascertained.

For these researches the area of the 'Cienda - San Vicente Farmers Community' (Barangay Gabas) on the island Leyte, Philippines were selected. First the fructiferous *C. bartramia* individuals were seized. Four existing large *Commersonia bartramia* populations could be identified.

2. Light measurements

For determination of the microclimate, PAR (Photosynthetically Active radiation) - and humidity - measuring sensors became used, measuring the PPFD (Photosynthetically Active photon flux Density) in µmol/m2s and respectively the rel. humidity in %. The microclimate were measured under *C. bartramia* individuals, on *I. cylindrica* areas, as well as in an already established Rain-

forestation Area.

The mathematical average values of the shading intensity (intensity of the PPFD after shining through the leafy canopy) of the PPFD measurements under *C. bartramia* are with approx. 35% around for instance a third more badly, than the locations in the Rainforestation Area with approx. 12%. As reference value a measurement on a 100 - 200 m^2 a clearing were chosen. By comparing the values with other light measurements from the literature however, it can be said that these values are around the factor ten too high, taking the irradiation over the canopy as 100% reference value and not as in this work, in a clearing.

In this case the measured PPFD in the Rainforestation - Area would be comparably with values in the understory of comparatively intact tropical rain forests from the literature (approx. 1 - 2% PPFD). So it could apply that those Rainforestation Area with an age of seven years exhibits a similar shading potential, as an understory in a relatively unaffected tropical Rain forest.

Likewise the values for the measurements under *C. bartramia* would be with only 3.5% PPFD only twice as high as in the understory, and therewith for one relatively isolated standing tree comparatively well.

In the literature it is said that the light intensity must be lowered under 20%, in order that *I. cylindrica* loses significantly biomass. Given that the absolute irradiation height is not indicated, the results can be transferred only with difficulty.

To strong irradiation leads to Photoinhibition and is damaging the plant, the critical value is thereby by shade- tolerant plants (approx. 500 µmol/m2s) lower than by shade-intolerant (approx. 1500 µmol/m2s), which additionally often possess a higher point of light compensation. Thus it is important to know, which irradiation heights reach the soil. It is well-known that the developing of *I.cylindrica* in the shade is more weakly and less Biomass is synthesised.

On areas on those *I. cylindrica* mainly grew, were 30% of the measured irradiation over 1000 µmol/m^2s. On areas with only few, respectively no *I. cylindrica* vegetation 5% of the measurements were average over 1000 µmol/m2s respectively almost none the measurements (2%). On the other hand there are usually irradiation heights of highest 100 µmol/m2s given (point of light compensation). Therefore it can be that it is important for the repel of *I. cylindrica*, that the understory is protected by the leafy canopy against a PPFD of over 1000 µmol/m2s, and thus shade-tolerant species can win the upper hand over *I. cylindrica*.

3. Measurements of rel. Humidity

The measurements of the rel. Humidity showed that in the light, the rel. humidity on the average is about approx. 45%, under *C. bartramia* between 70 - 80% and in that Rainforestation Area around 80 to 90%.
This average rel. Humidity in the light of 45% is a value also occuring in some desert- like areas. The water stress arising thereby for young plants without deep roots is apart from the stress by high irradiation strengths a further reason why many plants can not settle open habites.
But already an individual tree is sufficient to hold the rel. Humidity on a value of 70% , which corresponds to an improvement of the value around 3/5 . . The additional increase of the value in the Rainforestation Area (80%) is thereby only small. A rel. Humidity between 70 and 80% makes up a far smaller transpiration pressure for those plants, because with 100% the air would water-satisfied.
So *C. bartramia* can, apart from the protection against to high irradiation in the understory, also offers protection against drying stress and sets up a microclimate suitable for senstive species.

4. Germination

As laboratory for the germination served an old cabinet, in which the temperature and humidity could not be controlled. As sources of light served two 20W fluorescent tubes. The collected seeds were used in different trials each with 50 seeds. The different treatments had the goal to wash out potential chemical inhibitors.
The seeds germinated only in very small amount (on the average 1.7%, in the best individual case 9%). Most seeds had germinated within the first week of the attempt (77%), and starting from the thirteen day up to the abort of the attempt no more of the seeds germinated. The small germinating rate could therefore agitate very probably that the lighting conditions under the two 20W were too small, because this Watt number corresponds to an irradiation of 20 µmol/m2s. This is however rather an irradiation height, as she prevails in a forest under the leafy canopy. However due to the results for open habitates (there in most cases irradiation intensities of over 1000 µmol/m^{2}s were measured), and the fact that *C. bartramia* colonise this open habitate it would be necessary to use a lamp with a Watt number equivalent to a PPFD of approx. 1000 µmol/m2s