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## Comments

# A complementary note to Baldini's article "The impact of Covid-19 crisis on Plant Taxonomy: will we be able to approach to plant taxonomy as in the past?"

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On March 12, 2020, the World Health Organization (WHO 2020) declared the Coronavirus disease 2019 (COVID-19) outbreak to be a pandemic (Viner et al. 2020; WHO 2020). Over the last six months, the COVID-19 pandemic has generated major challenges for society and the global higher education (Crawford et al. 2020) and medical (Chatterjee et al. 2020) communities, among others. Within this scope and having read the recent comments published in *Webbia* 75: 3-4 by the Editor-in-Chief, Riccardo M. Baldini, I couldn't resist offering my modest opinion based on my own experiences as a result of the disruption of activities due to the new coronavirus.

In this note, I particularly follow up on Baldini's observations on how this epidemic has disrupted our society and changed our careers and professional endeavors in plant systematics and accessing natural history collections. In order to keep this note concise and in correspondence with Baldini's communication, I'll focus on some of the adverse effects and benefits that the COVID-19 epidemic has brought to our personal and professional lives in the herbarium and the field.

## DIFFICULTIES CREATED BY COVID-19

Among the numerous adverse effects, I will highlight only a few. Foremost, the epidemic has brought not only disruption to regular work habits but also the risk of death from infection and severe emotional pressure. Economic impact on households, particularly in developing countries, has added burden and stress to parents and family providers as a result of the loss of income, childcare services, and adequate nutrition. Immediate access to health care has been also challenging particularly in hard hit COVID-19 countries (Wang et al. 2020).

As researchers, educators and public servers, we are facing unprecedented times of social distancing. In relation to education, Cao et al. (2020) suggest-

ed that college students' mental health should be monitored during epidemics. Research training has also been halted by the COVID-19 pandemic. The conventional student hands-on interactive training involving field and/or lab courses has undergone several adjustments. These modules are now limited to very small groups and only under strict physical distancing rules while working and traveling, even during plant and data collection and analysis. Other daily adjustments include disinfecting protocols, self-monitoring for symptoms, remote work whenever possible, etc. Furthermore, when it comes to fieldwork across international borders, the situation is more complicated as some countries have closed borders and prohibited travel, especially to citizens from areas severely affected by COVID-19. In fact, during the initial outbreak several colleagues, including myself, had to abandon field sites because of the imminent outbreak with ensuing imposed national lockdowns and mandatory quarantine periods. Evidently, other issues impacting our society exist beyond the scope of this note.

#### BENEFITS AS A CONSEQUENCE OF COVID-19

Aside from education and research, an analysis (Greenstone and Nigam 2020) suggests that the proposed social distancing policies in response to the COVID-19 epidemic have significant economic benefits. That is, they have likely saved millions of lives and avoided overwhelming hospital intensive care units.

The ancient, yet commonly used, medicinal use of plants seems to have come back strongly. The ongoing epidemic outbreak has triggered research on neutraceutical and botanical agents against COVID-19 (Editorial 2020). Several extracts from *Morus* spp. exhibited antiviral activity on human coronavirus and are important as they have the potential in promising applications for antiviral strategies (Evans et al. 2020; Thabti et al. 2020). Quite likely more plant extracts useful to control the virucidal activity will be screened and characterized in the near future in search of a vaccine and cure for COVID-19.

The drastic and sudden lockdown with ensuing transition to online communication platforms has led to more effective online teaching and learning skills and quick redevelopment of online course offering. Considering the effects of the COVID pandemic on students, recent studies show the importance of online training for pediatric postgraduate students. In addition, the rapid curriculum redevelopment for fully online offerings in most universities indicates that students' satisfaction levels with online learning were comparable to the previous studies with the traditional classroom lectures (Agarwal

and Kaushik, 2020) and that it is important to plan a balanced integration of video learning with other course materials (Scagnoli et al. 2019).

With the advent of digital technology, we are able to offer virtual visits to our herbaria and collections despite the negative fact that numerous institutions have reduced and/or laid off staff by 20-40%, such as the American Museum of Natural History in New York and the California Academy of Sciences, respectively (Penisi 2020). Now more than ever, we value digital collections and virtual herbaria. Although working with real herbarium specimens and museum artifacts is a unique experience, owing to digital technology we can remotely access records and high-quality specimen images from the most important herbaria as well as the taxonomic and geographic databases associated with their collections. This brings to mind the precious, detailed, almost life-like, wax plant collection including plant anatomy models at the herbarium of the University of Florence (FI). These models were produced in the 1800s by talented artists working under the guidance of expert botanists, such as Giovanni Battista Amici (Abbott 2008). This, along with other valuable historical collections, like that of Andrea Cesalpino are among the nearly 5 million specimens hosted at FI.

In response to prevent the spread of COVID-19 at our herbarium (SASK), we have adopted strict safety guidelines established by our institutional leaders and the multidisciplinary Pandemic Response Team (PRT) in conjunction with health and government authorities. As our university gradually reopens for research activities, the herbarium, department and individual research labs are getting ready to work safely. Canadian and American institutions and individual units (facilities management, environmental health, security, custodial, transportation) are prepared to support the increasing on-site campus activities. In response to social distancing strategies on our herbarium facility and on campus, we're making plans to respect the required 2 m social distance among personnel, visiting researchers, students, and general public; disinfect common surfaces before and after use; wear personal protection equipment, whenever social distance is not possible, and keep a tracking logbook for the activity of personnel and visitors, in addition to the traditional approaches (Cota-Sánchez and Harms 2009).

Finally, I couldn't agree more with Baldini's comment regarding the much-needed face-to-face interaction at the personal and professional levels. We are social beings, and with the implementation of social isolation and remote conferences the importance of human interactions and relationships has become more evident. Unfortunately, I think that the likelihood that regular visits to herbaria

and other research facilities will be reinstated in the near future is low, especially with the new distancing norms. As an individual researcher and instructor delivering lectures, I am preparing for my online botany courses this coming fall. I already miss enormously the possibility of interacting with my botany students as well as visiting and learning from my colleagues and their important botanical collections in institutional herbaria across the world. I also wish we could go back to the face-to-face interactions during professional meetings, conferences and seminars. Zoom, FaceTime, WebEx, Microsoft Teams, among others, are excellent platforms for Webinars and group communication, but they lack the intimacy and comradery of face-to-face interactions.

Moving forward, I am hopeful that we will find solutions to continue to engage in multidisciplinary collaborations effectively, either on a personal basis or remotely and that we will be better prepared to face the adverse consequences of another potential social or health disaster. At this point our commitment to support scientific development and the use of natural history collection needs to focus on reinforcing efforts towards new graduate students in taxonomy and botanical sciences as well as young professionals, who are the future generation of plant systematics, guardians of botanical collections and biodiversity.

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