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Mutual Pan-African support paradigm to produce scientific evidence of traditional medical practices for use against COVID-19 and emerging pandemics[☆]

Michael O. Eze^{a,b,*}, Chukwunonso E.C.C. Ejike^b, Patrick Ifeonu^c, Javier Mignone^d, Chibuike C. Udenigwe^{b,e}, Peter N. Uzoegwu^f

^a Department of Chemistry, Health Enhancement and Public Health Biochemistry Lab, University of Winnipeg, 515 Portage Avenue, Winnipeg, Manitoba R3B 2E9, Canada

^b Department of Medical Biochemistry, Faculty of Basic Medical Sciences, College of Medical Sciences, Alex Ekwueme Federal University, Ndufu-Alike, Abakaliki, Ebonyi PMB 1010, Nigeria

^c National Association of Nigerian Traditional Medicine Practitioners, Nnamdi Azikiwe University, Awka, Anambra, Nigeria

^d Department of Community Health Sciences, Rady Faculty of Health Sciences, Max Rady College of Medicine, The University of Manitoba, 307 Human Ecology Building, 35 Chancellor's Circle, Winnipeg, Manitoba R3T 2N2, Canada

^e Faculty of Health Sciences, School of Nutrition Sciences, University of Ottawa, Ottawa, Ontario K1N 6N5, Canada

^f Department of Biochemistry, The University of Nigeria, Nsukka, Enugu, Nigeria

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ABSTRACT

Africa is endowed with a profoundly rich and diverse system of plants and other bio-resources out of which, by traditional medicine practice, the people have satisfied their healthcare needs right from antiquity. In contemporary times, it has become necessary to modernize this traditional medical care system via scientific studies.

Validation of the efficacy of health-enhancement products and drugs from plants and other bio-resources is predicated on diligent and intensive research accompanied by rigorous and conclusive clinical trials.

Africa has eminently qualified human resources but due to the finance-intensive nature of medical research, individual African states on their own cannot fund the level of research desired for dealing with such serious issues as the COVID-19 pandemic. A collaboration among African states guided by a Mutual Pan-African support paradigm (MPASP) is a unique strategy for achieving success in any such a high-impact global project as the use of traditional medicine against COVID-19 and emerging pandemics; and this is hereby advocated.

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Abbreviations: CAM, conventional and alternative medicine; CDC, centers for disease control and prevention; COVID-19, SARS-CoV-2 diseases 2019 [severe acute respiratory syndrome-coronavirus-2 disease 2019]; CWM, conventional western medicine; MERS, Middle East respiratory syndrome; MPASP, mutual Pan-African support paradigm; SARS-CoV-2, severe acute respiratory syndrome-coronavirus-2; SCD, sickle cell disease; SSHA, South-South humanitarian assistance; TCM, traditional Chinese medicine; TM, traditional medicine; WHO, world health organization.

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* Corresponding author at: Department of Chemistry, Health Enhancement and Public Health Biochemistry Lab, University of Winnipeg, 515 Portage Avenue, Winnipeg, Manitoba R3B 2E9, Canada.

E-mail addresses: m.eze@uwinnipeg.ca (M.O. Eze), javier.mignone@umanitoba.ca (J. Mignone), cudenigw@uottawa.ca (C.C. Udenigwe).

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Introduction

In this article we advocate for the African region to implement a concerted and quasi-unified action plan for the achievement of effective and enabling outcome in the fight against SARS-CoV-2 disease (COVID-19) and subsequent potential pandemics and emergencies. The consciousness has been raised by Peeri et al. [1]. They warned that humanity did not pay heed to the full lessons gleaned from the earlier two corona virus pandemics, namely: severe acute respiratory syndrome corona virus (SARS-CoV) disease, and Middle East respiratory syndrome (MERS). Consequently, COVID-19 seems to have taken the world unawares [1]. We therefore have to learn fast from our current COVID-19 experiences in order to be well-prepared for future emergencies, in whichever form they may occur.

Desperate search for curatives

The COVID-19 pandemic has jolted the entire world population, and has created the panic that now drives the momentum to discover specific curatives directed against the causative pathogen SARS-CoV-2 [2–4]. This task has proven to be a difficult one, demanding innovative strategies. The application of curatives from the nature trove of natural bio-resources, including *Artemisia annua* [5,6], *Azadirachta indica* [7–10], and others [5,6,9,10], has served humankind from antiquity in warding off infections and other forms of ill-health and disease. Thus, it can be surmized that phytochemicals and other bio-contents of natural origin (administered as extracts, in doses and combinations by intuition and practice) have yielded the success of humankind over disease and ill-health through these eons of existence on the planet. The current issue confronting humans is how to be able to reproducibly and consistently formulate the doses and combinations of the bio-resources and/or their active contents that can yield the solution to our problem: the direct killing and/or inactivation of the pathogen, SARS-CoV-2.

This process is critical and is daunting. It demands large investments in financial and competent human resources. The less endowed marginalized zones of the world are blessed with abundant natural bio-resources from which they derive the healthcare needs that have sustained them. However, in the face of deeply serious challenges like the corona virus infection, the establishment of effective regimens of the bio-remedies cocktail requires heavy investments. Nonetheless, these financial requirements could easily overwhelm the health research budget of any one resource poor nation (e.g., in Africa). Consequently, we need to have in place a strategy (or strategies) that mandate(s) the cooperation and collaboration of such member nations to enable them to pool their resources together. The pooled resources could then be used towards successfully tackling the challenges of such impactful assignments (as the COVID-19 pandemic) on a global stage.

The controversies surrounding the creation, promotion, and use of the COVID-organics anti-COVID tea of the Madagascan nation constitute a case-in-point. We advocate herewith that, in order to successfully tackle the needed intensive research and rigorous clinical trials necessary for raising the status of the COVID-organics herbal preparation to an efficacious anti-COVID-19 remedy, the collaboration and cooperation of other African nations are required.

Human beings thrive within nature and the ecosystem

Humans have relied on nature for acquiring remedies against disease and ill-health conditions all through millennia [5,11–15]. This constitutes traditional medicine (TM) from its origins in those times in antiquity before the advent of modern medicine or allopathic medicine, i.e., conventional western medicine (CWM). In simple terms, TM becomes complementary or alternative medicine (CAM) if it is practised outside of its indigenous culture [15,16]. We therefore distinguish TM/CAM from CWM in this paper.

The diseases afflicting humans include infections of various types caused by microbial and viral pathogens; plus (*inter alia*) chronic and other ailments including diabetes, hypertension, cancer, and degenerative diseases. The fact that generations of humans have been able to thrive and be sustained till the modern era is eloquent testimony to the fact that the herbal and other natural resources applied in TM practice since those ancient times have been efficacious enough to warrant and direct the preservation of our human species [5,11].

Medicinal plants are adapted to, and flourish in different zones of the globe

Some of the very important medicinal plants on the globe including *Azadirachta indica*, native to India [5,7], Burma and Ceylon (Sri Lanka), and *Artemisia annua* of Chinese origin [2,5,6], now flourish in Africa and other developing, underprivileged, and marginalized regions. These plants have been in use, with success for ages, against the multiplicity of health conditions mentioned (*vide supra*). In many cases, these herbal resources are consumed as crude preparations by the individuals. Sometimes, isolation and purification of the active molecules are done as a later stage.

These herbal/plant species serve as the main source of remedies against disease and ill-health conditions of the populace who, in the main, are inequitably endowed with Western Medical-/Health-care Systems (CWM). The populations have survived in these regions, thanks to their reliance on TM, predicated on the sustained availability of these and other vegetables and other natural resources in their local native environments.

The World Health Organization (WHO) has recognized TM

Over the years, the WHO has recognized traditional medicine (TM), and has advocated for, and encouraged its integration with conventional western medicine (CWM) for effective and affordable healthcare, world-over [11,15,16]. This is most advantageous in the developing world where western medical care is not easily accessible and it is expensive [5,12,15,16]. The WHO recognition and endorsement of TM has served as *bona fide* validation for various TM practices, including traditional Chinese medicine, Unani (Yunani) medicine, classical Arabic and North African traditional medicine; Indigenous American (North, Central, South) traditional medicine [17], and others [5,15].

As a region, the African continent is uniquely blessed with a rich endowment of relevant biodiversity, a plethora of which are vegetable sources of potential curatives against a large variety of disease and ill-health conditions. Africans ought therefore to tap into this vantage position, and take utmost advantage of it in the context of African healthcare systems [11,16].

The secret is in the plants

To date, work is still in progress to create a curative drug against COVID-19 [3,4,6,18–22]. The timely arrival of the COVID-19 vaccine was a most welcome development that has introduced new life and hope into the world, in the midst of the unfortunate devastations caused by the pandemic. However, research must be intensified for specific remedies to be in place against the disease. This is even more important, given the issue of emergence of variants and mutants that may potentially negatively impact vaccine efficacy.

Strategies against COVID-19 rely on using repurposed drugs (drugs originally developed for other diseases) (e.g., remdesivir [23]; hydroxychloroquine [24]; dexamethasone [25]; and traditional medicine (TM) [3,6,18,20,26]. It turns out that some of these repurposed drugs, for instance hydroxychloroquine [27]; remdesivir [28]; and dexamethasone [29] may have adverse side effects [10]. That China considerably managed the COVID-19 pandemic which originated in Wuhan city can therefore be imagined to be, to a large extent, due to the application of traditional Chinese medicine, combined with CWM [4,26,30,31]. These plant resources of traditional Chinese medicine contain health-promoting nutraceuticals (antioxidants, anti-inflammatories, anti-thrombotics, immune-modulators, etc.), a good many of which are known and characterized, e.g., polyphenols of various types (flavonoids, flavonones, flavones, and others) [2,32]. These natural compounds endow the patient with robust immune health [10], which is needed to quell the symptoms of COVID-19.

In addition, there are potential specific phytochemical anti-viral agents, including enzyme inhibitors, and ligands to SARS-CoV-2 proteins, whose identities may be unlocked in the future only through intensified appropriately directed research. For instance, *in silico* analysis by “*molecular docking*” led to the identification of such phytochemicals as glycyrrhizic acid, limonin, maslinic acid, ursolic acid, corosolic acid, and others as potential inhibitors of SARS-CoV-2 protein targets [33]. These potential anti-SARS-CoV-2 phytochemicals are contents of such plants as the neem (*Azadirachta indica*), licorice (*Glycyrrhiza glabra*), olives (*Olea europaea*) and *Citrus* species [9,10,33], and *Artemisia annua* [2]. The *molecular docking* technique has also been used to identify four phytochemicals from *Moringa oleifera* (kaempferol, pterygospermin, morphine and quercetin) as potential anti-SARS-CoV-2 ligands [21]. The antimalarial, Artemisinin (from *Artemisia annua*) and its derivatives, artesunate and arteminol, proved to be good ligands to SARS-CoV-2 proteins as well [34]. For other viral conditions, some specific antivirals have been identified. As an example, for Influenza A virus, Zhang et al. [35] reported that three tannin compounds, namely gallic acid, methyl gallate and pentagalloylglucose in *Bai shao* preparation, the aqueous extract of the root of *Paeonia lactiflora*, could inhibit the replication of influenza A virus in Madin-Darby Canine Kidney (MDCK) cells. The inhibition by gallic acid was found to occur via binding to Arg152 of the viral neuraminidase protein.

Mutual Pan-African support paradigm (MPASP) required

South-South humanitarian assistance

The practice of mutual assistance and collaboration in times of crises [the so-called ‘*South-South humanitarian assistance*’ (SSHA)] has been in vogue for more than half a century, among the developing world – the ‘*Global South*’ [36].

Marginalized, under-privileged and underserved peoples around the globe, including Africans and Indigenous peoples constitute the ‘*Global South*.’ They derive most of their healthcare needs from the practice of traditional and indigenous medicine. This is a consequence of the non-availability of affordable Western style Healthcare systems (conventional western medicine, CWM). These peoples practice the principles of South-South humanitarian assistance (SSHA) [36]. The authors Richey and colleagues (2021) [36] argue that South-South Humanitarian Assistance (SSHA)

‘can be traced back to the 1955 conference on Afro-Asian peoples held in Bandung, Indonesia, that brought together representatives of 29 nations and colonies in the decolonising Global South-approximately half of the world population at that time.’

It is a mutual cooperation and collaboration of the less privileged of the ‘*South*’, for some mutual advantage(s), without involving the developed world (the colonial masters; the ‘*North*’). It involves the principles of mutual Support Paradigm

of the type being enunciated in this paper. We are addressing the African region, as a case-in-point, and our base for effectiveness. Lessons learned could be adapted or adopted for the benefit of other regions of the 'South.'

Mutual Pan-African Support Paradigm (MPASP)

Africans should take the bull by the horns and, by applying currently available technological 'best practices', seriously endeavor to harness the rich African herbal resources at their disposal in the interest of the health of the African population, and others. Thus, clinical trials to validate the adequacy and efficacy of traditional medicine formulations against diseases, should be viewed with utmost seriousness. Governments of African nations should take this on as a challenge that is necessary for achieving emancipation and respect from the western world, if properly applied. It is therefore advocated herewith that African nations adopt this new paradigm termed "**Mutual Pan-African support paradigm**" (MPASP), which mandates them to fortify one another, and collaborate to promote any step in the right direction initiated by (or originating from) any fellow African nation in the achievement of any one global feat; in this case, the fight against COVID-19 and other potential emerging pandemics and challenges.

It would be a thing of pride to have a product (or products) that can be identified as mainly (or, possibly, entirely) African: natural product(s) from African plant(s), extracted, purified, characterized, formulated into a curative, and put through appropriate rigorous clinical trials in Africa (or in collaboration with industrialized nations in a type of *North-South collaboration* [37]).

Recognizing that Africa is also home to eminently qualified and competent human resources, a WHO consultant, Pharmacologist and Traditional Medicine expert, Professor Charles Wambebe is quoted to have stated in a May 31, 2020 interview (Amoye, T., 2020, Vanguard Nigerian Newspaper Online) (<https://www.vanguardngr.com/2020/05/80-of-nigerias-200-million-people-risk-contracting-covid-19-%E2%80%95-wambebe-who-consultant/>) that he believes that:

"..... Africa would have learned the lesson of looking inwards, identifying talents, mentoring them, and supporting them to develop their innovations into appropriate technologies."

A specific lesson from the past

The Artemisinin success story is relevant and instructive here. Artemisinin (*qinghaosu* in Chinese), a sesquiterpene lactone peroxide, is the potent antimalarial from an age-old Chinese medicinal herb *Artemisia annua* (Sweet wormwood; *Qinghao* in Chinese) [38]. The work on Artemisinin yielded one-half of the 2015 Nobel Prize for Physiology or Medicine, awarded to Professor Tu Youyou, a Chinese pharmaceutical chemist of the Academy of Chinese traditional medicine [39–41]; and BBC News Navigation (<https://www.bbc.com/news/blogs-china-blog-34451386>). These reports indicate that the Artemisinin story was the product of doggedness, diligence, motivation, sense of purpose and direction, displayed by Professor Tu Youyou and her team for many years. Based on information on the anti-malarial activity of *Artemisia annua* and other *Artemisia* species, which (during her relentless search) Professor Tu Youyou found in the archives of Traditional Chinese Medicine (TCM), she and her collaborators painstakingly achieved the extraction and purification of Artemisinin, the anti-malarial active compound in this plant *Artemisia annua*. This work transformed antimalarial treatment in contemporary times, and finally earned her the said 2015 Nobel Prize. The other half of the Prize was shared by two other scientists (Professors William C. Campbell and Satoshi Ōmura) for their discovery of avermectins, the potent naturally occurring curatives against endo- and ecto-parasites [42]. Thus, the drug Artemisinin is a phytochemical in a Chinese herb of longstanding therapeutic importance (prominently in use in China against malaria and respiratory and other conditions), and the researcher is Chinese, supported by China, and the appropriate Chinese Institutions.

Need for MPASP in a current African example

The African nation, Madagascar, produced COVID-organics, the (so styled) anti-COVID-19 herbal tea from one of the nation's major medicinal plants *Artemisia annua* (Sweet wormwood) and others. Unfortunately, as it stands, this is still work in progress. There have been no adverse effects of the tea recorded; however, the COVID-19 pandemic still rages on in Madagascar [43], despite the extensive use of the herbal tea. There is a need to reappraise the situation: review the fidelity and precision in the batch-to-batch compounding of the components, and the levels of the various herbal components in the concoction; identify active compounds and their SARS-CoV-2 molecular targets; and validate efficacy through rigorous clinical trials. Certainly, the Madagascans rely heavily on TM as of necessity, convenience, affordability and reliability for their healthcare needs. This is basically because of paucity of sustainable conventional western medical (CWM) care, and affordable prescription drugs [44]. The herbs (*Artemisia* species, and other indigenous herbs of the herbal tea) are trusted components of proven efficacy for other diseases and ill-health conditions. The phytochemical constituents are generally, in many respects, likely to be similar to the ones in the anti-COVID-19 efficacious Chinese medicines [26]. So, a new look at the COVID-organics formulation is definitely warranted in order to be able to establish the optimal concentrations of the active chemicals, and clinical evidence of efficacy.

As reported by the same [Agence France-Presse](#) (May 10, 2020) the WHO Africa director Matshidiso Moeti declared in a press briefing as follows:

“We would caution and advise countries against adopting a product that has not been taken through tests to see its efficacy,” calling on Madagascar to take the drink “through a clinical trial.”

The director further said that ... ‘in 2000, African governments had committed to taking “traditional therapies” through the same clinical trials as other medications.’ Therefore, the WHO ...

“Would very much like to encourage this scientific process in which the governments themselves made a commitment.”

This is a totally reasonable demand, we believe. The task involved is a daunting one. All hands ought therefore to be on deck. In this regard, other African countries should be involved as a matter of necessity and camaraderie. It would be prudent for all African nations to support one another in situations such as these, in the spirit of MPASP. It is necessary for the African Union (or major components thereof) to champion such developments in order to boost the chances for success in a serious endeavor of the magnitude of cure and/or effective management of a pandemic, for instance. It is gratifying to learn from the same [Agence France-Presse](#) (May 10, 2020) report that South Africa’s Health Minister Zweli Mkhize had agreed to “help” and that their South African

“.. scientists would be able to assist with scientific analysis of the herb.”

To guarantee authenticity and legitimacy, clinical trials should be done rigorously and exhaustively, to standards that could stand international scrutiny. It has been suggested that, for clinical trials, the COVID-19 patient population is low in Madagascar, but it stands to reason that cohort should be painstakingly studied as is. Then plans to collaborate with other populations should be made in order to boost the working patient numbers for further/conclusive rigorous clinical trials. Mbewa [43] reported in May 2020 that the African Centers for Disease Control and Prevention (CDC of the African Union) was to review the data at that time. It is therefore our hope that the same gesture will solidly back the renewed MPASP aggressive work ahead.

Africa should seriously establish the infrastructure and other enabling conditions so that Africa is able to exploit and utilize its abundant natural resources for taking care of health issues and emergencies. Although the world is battling COVID-19 at the moment, we expect that there could be further pandemics in future [19]. Africa (as a collective and consortium of nations) should therefore brace up and face the music.

At this point in the pandemic, the international community is in a hurry to secure effective strategies against COVID-19. Consequently, there is no room for inconclusive or controversial data; the types that led to the recent retractions of published results. This is only natural. It emphasizes the absolute need for scientific rigor in the derivation of data to exhaustively support appropriate clinical trials.

As a laudable and enabling step in the right direction, it has been reported (Vanguard Nigerian Newspaper Online September 21, 2020) (<https://www.vanguardngr.com/2020/09/who-endorses-protocol-for-coronavirus-herbal-medicine-trials/>) that ‘WHO experts and colleagues from two other organisations’

...“endorsed a protocol for phase III clinical trials of herbal medicine for COVID-19 as well as a charter and terms of reference for the establishment of a data and safety monitoring board for herbal medicine clinical trials.”

This is certainly a very welcome and encouraging development and should inspire African nations as stakeholders to take advantage of the MPASP concept in raising COVID-organics to the anticipated logical successful status: Effective remedy against COVID-19.

Intensive natural products research is advocated

The use of natural resources (for instance medicinal plants) applied alone or in combination as interventions against any specific ailments by traditional medicine practitioners has been guided by intuition and practice over thousands of years [8,11–14,16]. The various parts of the resource (e.g., leaves, bark, wood, roots, fruits, seeds or inflorescence, of plant) [13] contain mixtures of different active chemical compounds [16], some of which are useful (and potent), some toxic, and some bland [5]. Thus, administering the unprocessed plant part or its extract implies introducing into the patient’s body the complex mixture of potent, bland and toxic substances. Identifying the active ingredients as well as the toxic components thus becomes relevant as a key criterion for incorporating medicinal plants in modern day healthcare [3,12]. Efficacy could be due to a single active compound, or a combination of more than one, yielding synergy in potency, or simply additive effects [5,16]. As an important integral part of the investigations, toxic principles must be identified and eliminated. These advances in processes would logically constitute appreciable improvement, by current day Africans, to the valid, efficacious and safe medical practices successfully implemented by ancient dwellers on the African continent over millennia, underscoring the huge educational progress acquired by today’s Africans as compared to the ancestors.

There is a case in point with plants of the Euphorbiaceae family (e.g., *Croton tiglium*) used in herbal medicine in southern China and tropical Africa. The etiology of nasopharyngeal carcinoma in southern China, and of African Burkitt’s Lymphoma [45] is likely linked to the presence of phorbol diesters, potent tumor promoters [46] present in croton oil from the seeds of *C. tiglium*, and which may exist as contaminants in the herbal medicine preparation consumed [12].

Also, in the desperate search for specific anti-COVID-19 therapeutics, oleandrin, the toxic cardiac glycoside from the herb *Nerium oleander* is under investigation. In Vero cells in culture, Plante et al. [47] found 800-fold reduction in SARS-CoV-2 viral load at very low levels of oleandrin (0.05 $\mu\text{g/ml}$). These authors hope to discover a safe low level of oleandrin (below the toxic level) that may be used to reduce disease severity in COVID-19 patients; and also minimize person-to-person transmission at early infection. It becomes pertinent therefore to systematically intensify research along such lines as would lead in the right direction by the exploitation of the numerous herbal and other natural (e.g., animal, marine) resources that abound on the globe.

Advantage of MPASP in dealing with co-morbidities

Establishing a viable, virile, trusted, formidable African platform of note would snugly situate African views on any issue alongside other views on the global stage. This would create a profound advantage because it would enable attention to be duly focused on specific issues that seriously affect Africa preferentially. For instance, certain disease and ill-health conditions are serious problems in their own individual rights, and present even further special serious challenges when they are co-morbidities with COVID-19. As an example, there were over 200 million cases of the killer disease malaria globally in 2017, and 92% of these cases occurred in the WHO Africa region (most of them in sub-Saharan Africa) [48]. Malaria and COVID-19 have some symptoms (e.g., fever, headache and chills) in common, and this creates unique problems, as in the case of diagnosis. Thus, TM strategies applied against a disease (e.g., COVID-19) are invariably the same as (or similar to) those used against another, e.g., malaria. The case of Artemisinin (and other phytochemicals in *Artemisia* species) in malaria and COVID-19 is relevant here [3,34,38]. The same also applies in the antimalarial and anti-COVID-19 phytochemicals in the neem plant, *Azadirachta indica* [33].

Also, sickle cell disease (SCD) occurs disproportionately in sub-Saharan Africa, which harbours 75% of global SCD cases [49]. SCD patients are immunocompromised and are therefore at a higher risk for respiratory infections, which might cause pulmonary complications like acute chest syndrome [49]. Hyper-inflammation is associated with the cytokine storm in COVID-19; and there is hyper-inflammation in SCD as well [50]. Co-morbidity with COVID-19 therefore portends grave challenges. Consequently, it has been advocated that, to be able to achieve more effective outcome, SCD diagnosis and treatment should be integrated and aligned with existing health systems [49]. In this case, the plant resources used against COVID-19 can contain anti-sickling principles valuable to SCD patients. Thus, potential remedies for SCD are given necessary attention during COVID-19 research.

Other philosophies in support of mutual Pan-African support paradigm (MPASP)

Numerous voices over the years have supported the philosophy behind MPASP. A strong recent voice has been that of Fofana [51] who advises that: ‘...rather than just expect and accept handouts from developed nations, Africans (as a consortium of nations) can pool their resources together, and put up a good and effective fight against such a serious challenge as COVID-19, and thereby gain recognition and achieve emancipation.’ Fofana [51] (referencing Biney [52]), recognizes that ... ‘The philosophy of Pan-Africanism is at its core one of liberation.’ The author also opined that political leaders of the early 20th century, ‘including [Ghana’s Kwame] Nkrumah, saw the battle for independence as a shared struggle among African nations and worked together despite differing in their views of the forms of government and economic structure that their countries should adopt.’

While discussing the merits and demerits of the approach adopted by Madagascar in the COVID-organics controversy, Fofana [51] concluded as follows: ‘I am hopeful that, in spite of the terrible toll it has inflicted, this [COVID-19] crisis will also serve as an opportunity to establish more equitable partnerships and invest in local infrastructure and human resources to respond to this pandemic and the ones yet to come.’ This tantamounts to support of our “Mutual Pan-African support paradigm” (MPASP), and other such strategies.

The reaction to the COVID-organics controversy has also revealed emotions regarding “Africa’s place in the world” as expressed by (Richey et al. [36]). The acceptance of a plane load of COVID-organics by Tanzania from Madagascar has been hailed by some as a great show of South-South humanitarianism: Indeed, a philosophy that is consistent with Pan-Africanism, and surely fits well into the MPASP paradigm. These authors elegantly presented various perspectives of the issue within a broad spectrum.

The “concept of one-health in Africa” hinted by Dandara et al. [18] could as well actually be interpreted to mean one aspect of MPASP. The authors continued further to the concluding paragraph of their paper in which they express that they:

“ remain cautiously optimistic that the COVID-19 pandemic offers a new portal for collective imagination toward an inspired and robust science, technology, and innovation to stimulate Africa to utilize its resources and respond effectively to the pandemic and other diseases.”

For the purposes of our paper, the essence of our argument is that putting in action the MPASP philosophy would ensure the success of critically impactful issues of importance to the African, the Indigenous Peoples, other marginalized peoples, and the rest of the global population. In other words, global problems, solved by Africans, with available and sustainable African resources, for Africans, and the rest of the world would be facilitated.

Lessons from COVID-19 for the future

The case has been made for a futuristic view with optimism for harnessing the full power of relevant phytochemicals generally [11], and as specific anti-corona viruses [6]. This is certainly a step in the right direction. However, it requires dedication and tireless work. The African should aggressively aim at exploiting the rich diversity of the African vegetation for this purpose. Indeed, even some common African dietary/medicinal vegetables are rich in antioxidants, anti-inflammatories and immune-modulators [53–55] that would assist in boosting the COVID-19 patient's ability in quelling the potential cytokine storm associated with the disease.

The concerted quasi-unified action plan, engendered by MPASP, would also create an opportunity for African-specific comorbidities with COVID-19 to be addressed together as appropriate, for instance, from the standpoint of application of omics research as recently suggested by Dandara et al. [18].

Conclusion

The African ecosystem is richly endowed with abundant varieties of vegetable resources of profound curative and health-enhancement values. Traditional medicine based on these natural bio-resources has remained the major recourse for health-care among the African populace right from ancient times. With the advent of modern conventional western medicine (CWM), the merits of integrating the two systems have been recognized by the WHO. However, success in this integration can be achieved only if the traditional herbal and other bio-resources are subjected to rigorous scientific studies, accompanied with rigorous and conclusive clinical trials that could stand the test of international scrutiny.

Given that each African country may not be able to muster sufficient support for health research of the magnitude required, there is need for collective responsibility among African nations in supporting and promoting promising projects that would situate the Continent advantageously in achieving a global feat as in the fight against a pandemic like COVID-19. Establishing the *Mutual Pan-African support paradigm (MPASP)* would enshrine this unique strategy in African policies for achievement and recognition on the global stage.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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