

Importance of Research for Africa in Uninterrupted Mutation

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Abstract

Research in some sub-Saharan African countries does not provide sustainable solutions to the vital problems of hunger and poverty, underdevelopment, disease, poor education and rudimentary agriculture. For example, in sub-Saharan countries, the malnutrition rate has increased from 33.3% in 1990-1992 to 23.8% in 2012-2014. This decline was short-lived and the number of undernourished increased again. Total dependence on natural resources is the main cause of biodiversity loss. The lack of advanced technologies and frequent natural phenomena such as drought are slowing the economic boom in Africa. Research can now be the hope of a thriving African economy and gradually increase the standard of living. It is a challenge to overcome by starting to exploit many results of theses and articles. Applying these results can be a way out of hunger and extreme poverty. Many activities currently being carried out in Africa include unsustainable agriculture, mining, timbers' exportation and subsistence economics. Good management of these activities can be a means to truly support development.

Keywords: Research; Sustainable development; Overcoming hunger; Poverty; Socio cultural; Alternative medicines

negative impacts, which can stimulate awareness and investigate solutions.

Introduction

Since the creation, research is a pillar of the Development. It is by searching that primitive men discover fire, the rudimentary techniques of agriculture, hunting, construction, and clothing. The search from middle ages to age of metals revolutionized the world. Today, each area of development is has remarkable progress. For example, in the conquest of space, men walk on the moon, in the civil and military aeronautics there are high-performance airplanes, in medicine, it is now possible to transplant organs and mechanization has increased agricultural yield. As economy and technology progress, we are increasingly dependent on each other. But Africans in sub-Saharan Africa are largely dependent on the developed world. Biodiversity supplies the essential of medicinal resources that include various plants, animals such as insects and mammals. This is an excellent support for drug discovery [1-3]. Appropriate methodologies that have been developed for plant studies (medicinal plants, food plants, cosmetic plants and wild plants) support development in inter tropical countries [1-5]. The modernization of agriculture and cattle farming would also strengthen Africa's development [3]. But the effects of global warming and drought are unfavorable to such modernization [3]. Arid regions are more concerned about this situation. Thus, in these areas, food requirements are constantly difficult to supply. At a time when famine and hunger are reaching crisis levels, due to unfavorable economic, political systems and conflicts [6-9]. These conditions have reinforced efforts to seek the welfare of men in a safety environment. What are the main problems of Africa? Normally, research attempts to solve problems. Thus, in the next paragraph, we present the most important problems of Africa that have significant

Methodology and Discussions

If Africans know and become aware of their problems, they will think about of their systematic solutions.

Main problems of Africa

By 2060, the population of sub-Sahara Africa could be as large as 2.7 billion people. The population of sub-Saharan Africa is about 1.001 billion people distributed in 55 countries and mostly in 36 world's poorest countries of the planet [6]. An estimated 24.7 million people plus an estimated 1.5 new HIV infections in 2013, implying 71% of the global total patients suffering from HIV. 1.1 million died of AIDS were recorded the same year [6]. The sub-Saharan Africa region has the highest rates of malnutrition [6,10]. There were estimated 627,000 malaria deaths worldwide in 2012, WITH 90% occur in this region and children under 5 years of age were more affected (77%). An estimated 24.7 million people are living with HIV and 1.5 new HIV infections have been detected in 2013. A figure of 1.1 million deaths from AIDS was registered the same year [6]. The sub-Saharan Africa region has the highest rates of malnutrition [6,10]. An estimated 627,000 malaria deaths worldwide in 2012, with 90% among them in this region and 77% of them are children under 5 years of age [7]. The best epidemiological estimate of the burden of tuberculosis is 2,400 for the lowest and 3,200 for the superior of infectivity in Africa [11]. In sub-Saharan Africa, the prevalence of diabetes estimates in 2000 is 7,146 and its projection for 2030 is 18,645, as a percentage of the number of people with diabetes was 161 [12]. The percentage of gross prevalence of hypertension is 22.9 for men and 24.6 for women and the age-adjusted prevalence is 22.9 for men and 23.4 for women [13]. Sickle-cell anemia is most prevalent in the sub-Saharan countries with the

most affected populations, and the global prevalence will reach about 30% by 2050 [14,15]. These diseases are among the principal causes of mortality in sub-Saharan Africa. Ebola is today one of the most murderous diseases in three countries (Liberia, Serra Leone and Guinea) of this region, which fail to look for food security, since the levels of agricultural production have fell [3,16]. Therefore, low income farmers always produce for their survival [3,17]. Thus, disaster in this area is poverty and agriculture is the only activity for development [3]. Global warming is most important alarm that interacts with dryness, water erosion and poor agriculture [3]. Africa must combat desertification, drought, deforestation and global warming, which are the effects of increasing world population and the development of industries, which deteriorate an already difficult situation [18]. Tea tree (*Melaleuca alternifolia*), coffee tree (*Coffea arabica* or *Coffea robusta*) and cocoa tree (*Theobroma cacao*), are long time cultivated in Africa, and offer the three more important worldwide useful beverages today [3]. *Coffea arabica* will extinct like many wild species [3], under the global warming effect, around 2080 [19]. The link between the threats of food shortage and the climate change is recognizing by hundreds of millions of people [3]. The global warming activates droughts and places some most exposed people in a position of increasingly precarious crucial food requests [3]. Civil wars also help food deficits and hunger to reach emergency levels and refugees suffer enormously. Often Insects aggravate shortages and hunger. They are at the origin of many diseases and vectors of many human and animal parasites that include, Anopheles which transmits Plasmodium falciparum, Aedes which transmit Arboviruses, Mansonia and Simulium which transmit Wuchereria bancrofti and Onchocerca volvulus, respectively. In 2001, Heads of State, at the summit of the African Union, decided to invest 15% of their respective budget in to fight against infectious diseases in Africa. About 30 billion CFA francs are used again malaria in Cameroon in 2013 [20]. Insects are destructive and harmful to the crop. They have devastated farmers' crops. Consequently, the destruction of mangoes by the bacterium Bactrocera invadens, which is transported passively by insects, caused a loss of about 120 million CFA francs to the Central African Republic. Locusts Zoonocerus variegatus are the main harmful crops in West Africa. While in Central Africa ants are the most harmful of crops. They are widespread in this area and attack many crops. This statistic shows how insects have contributed and are still contributing to reducing the purchasing power of populations. The effects of insect pests are an urgent challenge for African researchers. Fortunately, sociocultural medicine and biodiversity can provide suitable solutions.

Possible solutions

A majority of drugs is marked from biological resources. At least 80% of Africa' population rely on traditional medicine [21]. In the nature which is the best laboratory for chemists, plants especially medicinal species produce organic compounds used as medicines. Certain specific organic compounds are erythropoietin for the treatment in hematology, infliximab for joint pains and insulin of substitution for diabetes, which intervene in therapeutic preparation in the form of antibodies and hormones. The nature also provides inorganic compounds useful as drugs that include lithium for psychic diseases and platinum used in chemotherapy [22-23]. Therefore the nature can provide numerous secondary metabolites necessary for drugs discovery for the world in general and for Africa in particular. Some bioactive plants that include the following species are already studied and may help in drug discovery.

Treatment of type I and type II diabetic patients by Momordica charantia: *Momordica charantia* called Bitter melon, bitter gourd or karalla (Cucurbitaceae), has shown hypoglycemic properties [24]. This species such as many other plants have hypoglycemic activities due to its several active substances like p-insulin (insulin-like protein) and polypeptide-p, responsible of the reduction of fasting blood glucose concentration in diabetic patients [24]. Triterpenoids like momordicin and momordicosides found in fruits and fatty acid found in strong levels in the seeds, reverse to insulin resistance. Prepared in form of powders, juices and extract, bitter melon has potential to decrease blood glucose rate [24]. The analysis of different groups of patients, who received bitter melon tablets for 12 weeks, has shown an important fall of glucose and cholesterol blood rate. High Density Lipoproteins, Low Density Lipoproteins, triglyceride, in tablets low the blood glucose concentration in treated diabetic patients group compared to diabetic non-treated group [23,25-26].

Blood pressure lowering and effect hypotensive of Asystasia gangetica: The aqueous leaves extract of *A. gangetica* control the high blood pressure induced in rats [27]. Both aqueous and metabolic extracts of *A. gangetica* exhibited a 20% and 51% respectively *in-vitro* activity inhibitory of converting enzyme of angiotensin I [27]. The direct vasoconstrictor actions of Angiotensin II formed from Angiotensin I raise the blood pressure in the presence of angiotensin I which is a converting enzyme *in-vivo*. The diminution of the outcome of Angiotensin I on the hypertension rate at the prescribed amount ≥ 100 $\mu\text{g/kg}$ is under the control of Angiotensin II which plays an important role of high blood pressure regulation.

The momentous decreases observed in the systolic and in the diastolic blood pressure were produced by co-infusing of *A. gangetica* aqueous leaf extract with Angiotensin I [27]. These diminutions were highlighted by comparing the blood pressure values observed with infusing Angiotensin I alone [27]. The conversion of Angiotensin I into Angiotensin II, which is a great vasoconstrictor, can be credited to *A. gangetica*. The noteworthy reductions observed in the cardiac pulse rate were resulted from the co-infusion of *A. gangetica* with the increasing doses of Angiotensin I and could be attributed to lesser quantities of Angiotensin II being produced [27]. This co-infusion opposed to the major increases observed at some doses with the concoction of Angiotensin I alone. The fixed dose of *A. gangetica* projected that the lower doses of Angiotensin I produced less Angiotensin II. At the same time as more Angiotensin II can be produced at the elevated doses. The activation of Angiotensin II receptors (AT_{1A}) found in the vascular smooth muscle cells provoked momentous increased blood pressure by Angiotensin II. This activity is due to the increased vasoconstriction that diminished kidney blood circulation and renal tubular sodium re-absorption and which also increased aldosterone. The co-infusion of *A. gangetica* aqueous leaf extract with Angiotensin II inhibited momentarily the outcome of Angiotensin II alone on blood pressure [27,28]. The significant reductions in heart rate were related with the above antihypertensive action. This result confirms that *A. gangetica* possessed chemical substances, capable to obstruct at its different receptor sites, the activities of Angiotensin II [29]. Certain species like *Moringa oleifera*, are particularly important in fighting again poverty.

Moringa oleifera: a plant with multi-utilities

Food plant: *Moringa oleifera* is a food producing plant, cultivated for its fruits that are eaten cooked or raw and exported fresh or as tinned food. In Sahelian regions, leaves of *Moringa oleifera* are eaten like vegetable and those of *Moringa stenopetala* constitute the standard

food of Konso tribe of Ethiopia. Nutritional analyses have shown that leaves of *M. oleifera* are richer in nutriment including vitamins, minerals and proteins than the most vegetables. Proteins and calcium are two times more than in milk, as much potassium like in banana, as much of vitamin A like in carrot, as much of iron like in cow meat and more than two times vitamin C than in orange [30]. Many programs used the leaves of *Moringa oleifera* for undernourishment and its associated diseases that include kwashiorkor, immunodeficiency, anemia, nutriment's deficiency). From seeds, important cooking oil and an interesting raw material for cosmetic industries (soaps, perfume) were extracted. *Moringa* spp. roots produce a condiment [31-32].

Cancer treatment

The diversity of medicinal plants and the variability of their mechanism of action have given to plants the potentialities to be an inexhaustible source of anticancer drugs [33]. Medicinal plants with the exploitation of apoptosis method are become an important source for cancer's drugs. Thus, on human tumor cells in culture mediums for a period of 40 mn, with different concentrations of leaf extracts of *Moringa oleifera*, the evaluation of cells variability percentage has permitted to demonstrate that in dose-dependent, the leaf extracts of *Moringa oleifera* inhibit the multiplication of KB cells. The antiproliferative action of these leaf extracts was linked with the exploitation of apoptosis method to provoke the morphological modifications and the DNA breaking up into fragments [33]. Thus, the *M. oleifera* leaf extracts had a powerful antiproliferative effect and strong stimulation of death cells [33]. These results showed that *M. oleifera* leaf extracts possesses potential power for cancer chemoprevention [33]. For this reason these leave can be confirmed as a curative aim or principle for which effort is intended for cancer [34]. The fruit parts that include pods and seeds of the *M. oleifera* defend cells from corrosion break [34-36].

Diverse diseases' treatment: It has been demonstrated that *Moringa* spp with its antibiotic properties reduce the growth of microorganisms like bacteria [33]. The seeds were the most important *Moringa* spp part containing an antibiotic activity responsible of the control of infections [33]. The authors showed also that the microelements including Potassium, Magnesium, Calcium and Zinc are useful for arterial hypertension control [33]. This important richness of *Moringa* in nutrients has been minimized the risk of hypertension by promoting proper blood vessel function [33]. In case of anemia *Moringa oleifera* has been used as supplement [33]. The low levels of vitamin E and D is one of the higher risks of diabetes [33]. Since the centuries, *Moringa* has been used by India's healers for the treatment of diabetes [33]. Antioxidants of *Moringa* protect man against infections and degenerative diseases by inhibiting and scavenging free radicals.

Water purification: *Moringa* spp seeds efficaciously purify water (elimination of turbidity). The use of these seeds offers a double advantage: The substitution of imported flocculent by a local product, easily accessible, permit an important economic devise for South countries and this natural flocculent is completely biodegradable [27-28]. Others potential applications of *Moringa* spp include feed of animals, production of vegetal hormones, biofertilizer, pulp, and pharmaceutical products.

Effects hypoglycemic and reduction of cholesterol and fats levels in tissues and serum: It has been shown that an oral administration of an aqueous extract 200 mg/kg of body weight of *Scoparia dulcis* to

streptozotocin diabetic rats for 6 weeks, reduces significantly the rate of the following parameters: Blood glucose, serum and tissue cholesterol, triglycerides, free fatty acids, phospholipids, 3-hydroxy-3-methylglutaryl (HMG)-CoA reductase activity, very low-density and low-density lipoprotein cholesterol levels [37]. Also during this treatment the authors revealed that other parameters that include serum high-density lipoprotein cholesterol, anti-atherogenic index, and HMG-CoA reductase activity in diabetic rats, have decreased [37]. It was also demonstrated that a hypolipidemic effect was observed in normal animals by similar administration of *S. dulcis* plant extract [37]. The authors compared this effect with 600 µg/kg of body weight of glibenclamide. From this comparison they concluded that in normal and experimental diabetic rats, the *S. dulcis* extract presented both an antihyperlipidemic action and antidiabetic activity [29]. The modernization of agriculture is key factor for a sustainable standard of living.

Sustainable livelihoods

Moringa oleifera important role for urban citizens: More the population of Africa is increasing; more people are suffering from hunger. Morphologically, *Moringa oleifera* reaches a height of 5-10 m in the fertilized soil [5]. Very useful for humans, animals and the environment, this small tree is cultivated all over the world [38]. We have seen that leaves, fruits and roots of *Moringa* have some interesting food and medicinal properties. In many overcrowded cities, empty land becomes scarce and regardless of the smallest available space around the houses, it is used to grow *Moringa oleifera* (Figures 1 and 2).



Figure 1: Urban homestead and harvest of *Moringa oleifera* [33].

In very small gardens, seeds spaced 10 cm apart from each other [38] can help to obtain a significant amount of *Moringa oleifera*'s leaves. The harvest of these leaves will be done by cutting down of stem at 30 cm height [38]. Leaves separated from the stems is either used fresh or transformed into powder for human treatment and the livestock consume the rest of stems [38]. Very often the stumps don't die and they reproduce young stems which will become mature for the second harvest just in 50 days [22]. In the Sahelian regions, the *Moringa* tree plays an important environmental role in the fight against desertification partially caused by climate change [27-28]. Because of its many uses, its cropping system and its rapid growth, *Moringa oleifera* like *Azadirachta indica*, can produce substantial income for farm families to alleviate hunger, poverty and soil degradation. The economic and environmental roles of these trees have aroused the development of trees nurseries in many countries.

Tree Nursery Incomes

Original vegetations are rare in many areas of Africa today. The reintroduction of trees in the nature becomes a priority in many countries. The selling of plantlets is now an important source of income (Figures 3-6).



Figure 2: Traditional urban cultivation of *Moringa oleifera* in Yaounde town.



Figure 3: *Guibourtia tessmannii*.



Figure 4: *Baillonella toxisperma*.



Figure 5: *Afrostyrax lepidophyllus*.

The price of a seedling varies between 1.64 and 8.2 US dollars depending on the species. The cultivation of domesticated and wild fruits, medicinal plants and food crops increased the income of the poor's of thousands of African rural families [39]. It can do more if many Africans are interested. IFAD (International Fund for Agricultural Development), which has supported this activity, has increased the purchasing power of local populations in Cameroon, Democratic Republic of the Congo, Equatorial Guinea, Gabon and Nigeria [39]. This program allows thousands of farmers to benefit from plant domestication, agriculture and medicinal plants. For better identification of the best plants of high value, biodiversity prospecting is a key method.

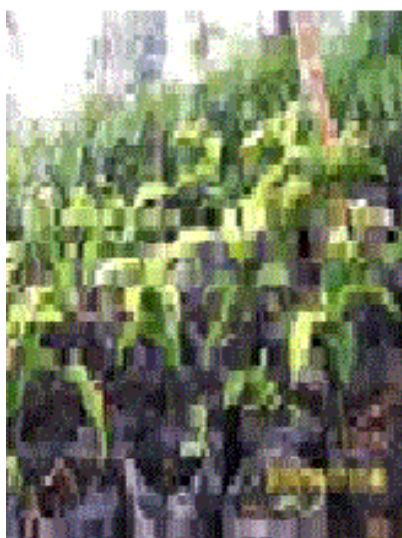


Figure 6: *Diospyros* sp.

Prospecting and Opportunities for Long-Term Exploitation of Biodiversity

Today, local therapists have developed more herbal medicines from various plants to cure several diseases. A few biological resources are used for producing medicines [9]. The discovery of new medicinal plants used by indigenous people is an important key for drugs' development worldwide (Figures 7 and 8).



Figure 7: Ethnobotanical survey's sessions in Yabetta tribe, Cameroon.

Eighty percent (80%) of chemical substances in United States market are found in microorganisms, animals and plants [2,40]. New medicinal plants are potential sources of new chemical compounds. Nearby, 80% of the world's population uses herbal medicines for primary health care [2,26]. For now, the medical value of a few wild species has been approved [2]. The unsustainable biodiversity's exploitation would amplify biodiversity degradation [2]. It is very important to respect the global consents that include the Convention on Biological Diversity, which confers autonomous national rights on biological resources. These agreements obligate countries to conserve

biodiversity, to use resources in sustainable way and share the profits resulting from their exploitation.



Figure 8: Ethnobotanical survey's sessions in Yabetta tribe, Cameroon.

Conclusion

In this world in uninterrupted mutation, people struggles to find competitive innovative products for man needs. Africa must work with the rest of the world for overcoming its misfortunes, including the emergence and re-emergence of diseases, climate change and the loss of biodiversity. African trustworthy solutions for world problems are very few, sub-Saharan Africa is particularly concerned. The settlement of young people in Africa's countries for agriculture, diverse sports, art, music would able to substantially limit illegal immigration. In Africa, socio-cultural medicine linked to biodiversity is an important instrument of development through its valorization. By publishing articles the international group OMICS offers commendable development tools.

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