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COURSE: BCH 408 (PHARMACOLOGICAL BIOCHEMISTRY)

MATRIC NO: 16/SCI03/003

ASSIGNMENT TITLE: Nigerian traditional medicinal plants in therapy

QUESTION: Write on the efficacy of commonly used Nigerian medicinal plants in the treatment/ management of the following:

1. Malaria
2. Diabetes
3. Cancer
4. The Efficacy of commonly used Nigerian medicinal plantsin the treatment of malaria

Malaria is a global disease that is predominant in the tropics and caused by blood parasites, Plasmodium falciparum, Plasmodium ovale, Plasmodium malariae and Plasmodium vivax. In Nigeria, malaria is mostly caused by P. falciparum and P. malariae. The female anopheles mosquito transmits these parasites to humans. Plants are often considered to be useful against infectious diseases, which are used as alternatives to synthetic compounds without regard to different etiological agents (viral, bacterial, fungus and protozoa) in traditional medical practice. The wide reports of *Harungana madagascariensis* plant parts that are used in various infectious disorders points to the fact that the plant constituents could be potential anti-infective candidates for the treatment of viral, bacteria, fungi, and protozoa (Kouam *et al*., 2007). *Harungana madagascariensis* (Choisy) Poir. (Hypericaceae) is otherwise called dragon’s blood tree. The genus is monotypic, the single species being found in tropical Africa, Madagascar, Mauritius and Mascareigne Island. The local names are “Amuje”, “Aroje”, and “Arunje”. It is widespread and locally abundant in areas where annual rainfall exceeds 1300mm. Research has demonstrated that phyto-chemical constituents present in the stem bark extract of *Harungana madagascariensis* used in traditional medicine to treat infectious diseases, exhibited anti-protozoan activity against Trichomonas gallinae in vitro and Plasmodium parasites both in vivo and in vitro. This however, supports the reports of Ndjakou Lenta *et al*. (2007) that showed the leaves and root bark extracts from *Harungana madagascariensis*, which inhibited another protozoan *Entamoeba hystolytica* growth in an investigation on the putative anti-amoebic and *Plasmodium falciparum* isolates respectively. Some of the constituents and isolated compounds from *Harungana madagascariensis* includes: flavonoids, alkaloids, saponins, glycosides, and tannins (Moulari et al., 2006a,b). Three prenylated anthranoids: harunmadagascarins C and D and kenganthranol D, three prenylated 1,4-anthraquinone: harunmadagascarins A and B, harunganol B and harungin anthrone (Kouam *et al*., 2007), Bazouanthrone, a newanthrone derivative, has been isolated from the root bark of *Harungana madagascariensis*, together with other known compounds, feruginin A, harunganin, harunganol A, harunganol B, friedelan-3-one and betulinic acid (Ndjakou Lenta et al., 2007). These compounds a The most recent work of Ndjakou Lenta et al. (2007) showed the anti-plasmodial effects of six isolated compounds from the root bark of *Harungana madagascariensis* in vitro. Many isolated compounds from natural products have been tested in vitro for anti-malarial properties; and found to exhibit potent activities (Rukunga, 2006). Some other plants in Nigeria used to treat malaria are as follows:

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| S/N | Scientific name | Family names | Local names | Common names | Parts used |
| 1 | *Enantia chlorantia* | *Annonaceae* | Awopa | African yellow wood | Bark |
| 2 | *Khaya grandifoliola* | *Meliaceae*  | Oganwo | Mahogany | Bark |
| 3 | *Melicia excels* | *Moraceae*  | Iroko | Iroko | IRoot, Bark |
| 4 | *Senna siamea* | *Caesalpiniaceae*  | Kasia | Senna | Bark |
| 5 | *Tithonia diversifolia*  | *Compositae* | Jogbo Agbale | Tree marigold | Leaves, stem twing |
| 6 | *Curcuma longa*  | *Zingiberaceae* | Laali-pupa | Turmeric | Rhizome |
| 7 | *Citrus aurantifolia*  | *Rutaceae* | Osan wewe | Lime | Root, bark, stem- twigs, leaves, fruit |
| 8 | *Funtumia africana*  | *Apocynaceae* | Ako-ire | Funtumia | Root |
| 9 | *Vernonia amygdalina*  | *Compositae* | Ewuro | Bitter leaf | Leaves |
| 10 | *Ceiba pentandra*  | *Bombacaceae* | Araba | Kapok tree | Leaves |

1. The efficacy of commonly used Nigerian medicinal plants in the management of diabetes

Nigeria is richly blessed with abundant medicinal plants within the nation’s biodiversity and most of them have been scientifically validated for the management of diabetes mellitus. Diabetes mellitus is a metabolic disorder of multiple etiology characterized by chronic high blood sugar with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action or both. Several species of medicinal plants used for the management of DM worldwide have been evaluated. Some of the plants include: *Allium cepa* (Onion), *Allium sativum* (Garlic), *Aloe vera*, *Cinnamomum cassie*, *Coccinia indica*, *Gymmema slyvestre* (Gurnar), *Momordica charantia* (Bitter Melon), *Catharanthus roseus* (Madagascar Periwinkle), *Muurrayi komingii*, *Ocimum sanctum*, *Panax ginseng*, *Trigonella foemum-graecum* (Fenugreek) *Pterocarpus marsupium* (Indian Kino) and *Syzigium cumini*. A survey of several medicinal plant research findings showed that the polysaccharides, sterols, terpenoids, alkaloids, saponins, flavonoids, amino acids and their derivatives are the most encountered bioactive principles that exhibited glycemic control in experimental animals (Paul, 2016).

*Coccinia indica*

Orally administered pectin materials isolated from fruit extracts of C. indica at dose = 200 mg/100 g body weight/day caused hypoglycemia in normal rats. The study noted that pectin materials caused significant reduction in blood glucose and an increase in the liver glycogen as a result of increase in hepatic glycogen synthetase activity and corresponding reduction in phosphorylase activity. Hypoglycemic effect of ethanolic extract of C. indica is partly due to the repression of the key gluconeogenic enzyme (glucose-6-phosphatase), but did not affect alanine aminotransferase and aspartate amino transferase activities, in starved male rats.

*Momordica cymbalaria* (Bitter Melon)

Oral and intra-peritoneal administration of aqueous fruit extracts of M. charantia to normal rats lowered the glycemic response without altering the insulin response. Also, aqueous extract and the residue after alkaline chloroform extraction reduced hyperglycemia in diabetic mice after 1 hour. The recovered plant matters by acid water wash of the chloroform extract following alkaline water wash engendered a slower hypoglycemic effect. These findings suggested that orally administered M. charantia extracts lower glucose concentrations independently of intestinal glucose absorption and involved an extra-pancreatic effect. In another study, M. cymbalaria fruit powder caused reduction in blood sugar concentrations in alloxan-induced diabetic rats following 15 days treatment. Elevated serum cholesterol and triglycerides levels were lowered with significant improvement in hepatic glycogen level in treated diabetic rats. The study showed the anti-diabetic and hypolipidemic properties of M. cymbalaria fruit powder.

*Muurrayi komingii* (Cury leaf)

A single oral administration of aqueous leaf extracts of M. koenigii (doses = 200, 300 and 400 mg/kg) lowered blood glucose level in normal and alloxan-induced diabetic rabbits. The reduction on blood glucose levels in normal and mild diabetic rabbits corresponded to 14.68% and 27.96% following 4 hours of oral administration of 300 mg/ kg of the leaf extract. Likewise, 300 mg/kg of the leaf extract caused a marked improvement in glucose tolerance by 46.25% in sub-diabetic and 38.5% in mild diabetic rabbits at 2 hours post prandial test. The study suggested that the aqueous leaf extracts of M. koenigii may be prescribed as adjunct to dietary therapy and treatment of DM. Aegle marmelos possess anti-diabetic and hypolipidemic effects in diabetic rats.

Nigerian indigenous anti-diabetic medicinal plants

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| Plant and Family | Plant part used | Bioactive principles | Mechanism of action |
| *Coccinia indica;* Cucurbitaceae.  | Leaves | Beta sitosterol. Pectin  | It Suppresses glucose-6-phosphatase. Stimulate glycogen synthase activity and reduction of phosphorylase activity. |
| *Momordica cymbalaria* (Bitter Melon); Cucurbiteae | Fruit pulp, seeds, leaves and whole plant. | Charantin (a peptide). Insulin-like polypeptide P (vegetable insulin) | Stimulate insulin secretion.It helps to suppress the activity of gluconeogenic enzymes.It increases β-cells in diabetic rats. |
| *Muurrayi komingii* (Cury leaf); Rutaceae. Aegle marmelos Corr. (Rutaceae). | Leaves. | Carbazole alkaloidsCopolin- α-glucose | It helps to stimulate insulin secretionIt helps to increase glycogenesis and decrease glycogenolysis. |
| *Ocimum sanctum* (Holy basil); Lamiaceae.  | Leaves | Pectins | It helps to stimulate insulin secretion |
| Syzigium cumini (Eugenia janbolaria); Mytaceae | Seeds, leaves and fruit pulp | Mycaminose | It helps to stimulate kinases involved in peripheral utilization of glucose |

1. The efficacy of commonly used Nigerian medicinal plants in the management of Cancer

Cancer refers to abnormal cellular growth characterized by excessive proliferation of cells which occurs due to the loss of control of cellular growth and development. It ultimately spreads to other cells thereby causing them to become cancerous and when these cells aggregate, they form tumors. Cancer is one of the leading health problems in the world and several anticancer therapies have been developed to manage the disease. In orthodox medicine, cancer can be treated with drugs and radiotherapy if detected early. Otherwise surgical operation is used at some stage after which it can become very difficult and hopeless. However, nature has some remedy for cancer patients. Some substances have been found to be anti-carcinogenic, i.e they fight cancer forming cells and help to eliminate them from the body, for example cumaric acid and lycopen which are found naturally in tomatoes fruits (Lycopersicum esculentum L.) and the leaves of bitter leaf (Vernonia amygdalina Del.). Also, a lot of research has been and is still being done on the effectiveness of Aloe vera (L.) Burm.f., *Morinda lucida* Benth, *Nympheae lotus* L. and *Pycanthus angolensis* Welw. Warb. for managing cancer. Literature has revealed that most of the synthetic drugs that have been used in the past have negative effects that were of grave consequence in some cases, especially when taken by patients on self prescription after an initial visit to the physician (Olapade, 2002). Formulation of the dosage of the extracts from the recipes must be strictly adhered to for maximum efficacy and also the avoidance of over dosage which may lead to other complications in patients. One major advantage of Traditional medicine is that, it is cheaper than orthodox medicine. While drugs alone are not the only means of providing health care, they do play an important role in protecting, maintaining, and restoring the health of people. Information gathered from the herbalists shows that increasing number of people are turning to the use of anti-cancer which shows that they are effective and efficient in the management of cancer. Traditional medicine has higher benefits than any other health care system as it is cheaper, readily available and could cure permanently. Apart from this, it has no side effect and is capable of saving for the nation, huge foreign exchange which can be used for other development programme. The following Nigerian medicinal plants are used to manage cancer.

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| S/N | Family Name | Botanical Name | Local Name | Plant part used |
| 1 | Anacardiaceae  | *Lannea egregia (Hiern)* Engl | Ekudan | Leaves |
| 2 | Compositae  | *Vernonia amygdalina* Linn | Ewuro | Leaves |
| 3 | Chenopodiaceae  | *Chenopodium ambrosioides* Linn | Arunpale | Leave |
| 4 | Bignoniaceae  | *Kigelia africana* Benth | Pandoro | Leave bark |
| 5 | Labiatae  | *Ocimum basilicum* Linn | Efinrin | Leaves |
| 6 | Liliaceae  | *Allium sativum* Linn | Alubosa ayu | Bulb |
| 7 | Nympheaceae  | *Nymphaea lotus* Linn | Ewe osibata | Leaves |
| 8 | Phytolacaceae  | *Petiveria alliacea* Linn | Awogba | Root |
| 9 | Hyperiaceae  | *Harungana madagascarensis* Lan. ex poir | Aroje | Bark |
| 10 | Celastraceae  | *Celastrus indica* L | Ponju owiwi | Root |

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pp 98-105.