Botanical Nomenclature

Brassica oleracea L. var. acephala

Family: Cruciferae/ Brassicaceae (cabbage or mustard family)

Common names: collards, flowering cabbage, tree cabbage, non-heading cabbage, cole, (kale)
Sukuma Wiki (Swahili), *Couve* (Brazil), *Couve-galega* (Portugal), *(col) berza* (Spanish)

Definition of drug

Green rosette of leaves

Identification

Biennial herb with deep, green, broad, oval shaped and glabrous leaves with repand edges. Leaflets are oppositely placed at its stipule, forming a rosette around the stem. The oval leaves are palmately veined with a thick rib down its center. The plant produces a flowering stalk biennially. The inflorescence is racemose with four distinct sepals and petals that form a cross-like pattern, hence the common family name of "crucifix" [*Cruciferacae*.] (McMurray, 2005)

Collards, true to its *Brassica* family, also produce a perfect flower containing ovary, stamen and pistil. The ovary is superior with two carpels that house its seeds. The embryo leaf of the seed (cotyledon) is wide and deeply notched. There are six stamen: four long and two short. At maturity, the plant is 1-3 feet wide and 2-6 feet high.

Taste/Odor/Energetics

Mildly bitter; pungent. When harvested in its peak season of late autumn- early winter, collards are less bitter and have a sweeter taste.

As a winter herb, collards' mildly bitter quality makes it a cooling herb energetically.

Summary of physiological actions

In the study of food as medicine, *Brassicaceae* leads the vegetation family in cancer prevention research. Click on any nutrition website or flipped through countless professional and lay journals and you will discover the value of adding collards and its family members to your healthy lifestyle diet.

The effects of collard green nutrients in the human body are primarily described in relation to cancer protection:

Anti-oxidant, anti-carcinogen, phytoestrogenic, nutritive, anti-tumor, hepatoprotective (See Appendix II for definition of these terms.)

Phytochemicals and Key constituents

Plants, like all things alive and well, have natural protective mechanisms that support their health and well-being. These protective mechanisms can be found within the plant's biological and chemical make-up and are known as 'phytochemicals' in the scientific world.

Many phytochemicals serve as the natural immune system for plants in defense of environmental stressors including insects and other pests. These magical medicinal properties of plants support their life. They may also be the mechanism that supports human and animal life as well, through the process of food assimilation. For example, Collard greens and other *Brassicas*, have the ability to synthesize phytochemicals called glucosinolates. Glucosinolates provide protection against insects and other plant herbivores. They are later converted in the digestive tract to bioactive isothiocynanates. These nutrients support the immune system by acting as antibacterial, antifungal and anticarcinogenic agents. (Rose, 2004)

The key constituents of collards are in the form of vitamins and minerals-the basic chemical building blocks that supports human physiology. These include:

Vitamins: A, C, K, Folate, Beta Carotene (including Lutein and Zeaxanthin)
Minerals: Calcium, Potassium, Magnesium, Phosphorus, Sodium, Zinc, Cooper, Manganese, and Selenium
Additional chemical agents: Carbohydrates & Fiber, Glucosinolate (Indol-3-carbinol)

The majority of the current scientific research on collards and *Brassicaceae* in general, is in cancer prevention and intervention. The focus of the following section 'Pharmacology' is in the role of collards in supporting immune function, cancer prevention and cancer intervention.

Pharmacology

Collards provide a major source of vitamins and minerals in the human diet. The United States Department of Agriculture (USDA) establishes the "Recommended Daily Allowance" (RDA) of nutrients for food sources. The RDA is established by calculating the minimum quantity of a specific nutrient needed to avoid health deficiency and/or disease. It is not a "recommendation" for health as many Americans are lead to believe and rely on.

The USDA's Nutrient Data Laboratory (NDL) maintains the National Nutrient Databank that delineates the bio-chemical composition of foods. The vitamins, minerals and other constituents noted below are referenced by the USDA's NDL for Collards (see Appendix III).

Current scientific studies and research on collards includes evaluation of the plant constituents' bio-availability, and whether these constituent levels are consistently shown throughout various collard plants cultivated overtime. Since collards, like other *Brassicas*, are proving to be a great source of vitamins and nutrients needed to combat degenerative diseases like cancer, researchers are encouraging the cultivation of plants with specific amounts of available vitamin and mineral nutrients. (Kopsell, 2004)

Although collards contain the following vitamins and mineral nutrients, they are by no means the only source of such in the human diet. Consider collards an example of good, healthy food that contains nutrients essential for maintaining life. Think how healthy the population would be if all of their food choices were fresh, whole foods!

The following is a short description of the vitamins and minerals currently found in collards. The nutrient description is based on the current research on that particular group of vitamins and minerals not solely on collards per se. Current research does support collards as well as other green leafy vegetables in the human diet as good sources for the vitamins and minerals suggested. (http://www.nal.usda.gov)

An understanding of the specific nutrients that comprise the biochemical make-up of collards is key to understanding the current research that is being conducted on this plant as well as a host of other *Brassicas*.

The Carotenoids and Other Fat Soluble Vitamins

Fat-soluble vitamins are stored and metabolized in the fatty tissues of the body. Carotenoids are the source of Vitamin A found in collards. Carotenoids provide Vitamin A to the human body when they are synthesized during the metabolic process. (Fairfield, 2002)

Vitamin A supports cancer prevention by regulating the process of epithelial cell differentiation (Steinmetz, 1991). Cell differentiation is the process by which an individual cell develops its unique features to support organ systems. The inability of

cells to differentiate is a sign of cancer. (Steinmetz, 1991) As Vitamin A is converted to caroteniods, it supports cancer prevention as an 'anti-oxidant': it deactivates oxygen molecules that are generated as by-products of normal metabolic processes yet become free radicals that often lead to oxidative DNA damage. (Steinmetz, 1991)

Beta Carotene is one of over six hundred carotenoids- the color pigmentation of orange and yellow colored plants. Even though collards appear green, it is the chlorophyll content that gives them the green presentation. As the leaves oxidize, chlorophyll is lost and their leaves turn yellow revealing the true carotene color underneath. Beta Carotene is known as the precursor to Vitamin A because of its ability to carry out Vitamin A type functions in the body.

Beta Carotene is a powerful anti-oxidant that supports immune function in reducing certain cancers. For example, a study conducted on adults ages 39-79 diagnosed with primary or first stage colon cancer, were asked to increase their dietary intake of vegetables, including collards. By changing their diets to include carotene-rich vegetables, the subjects in the study significantly reduced their risk of developing secondary colon cancer. (Slattery, 2000)

Several recent studies are underway to support the nutritive effect of the carotenoids lutein and zeaxanthin in age-related eye diseases such as macular degeneration and cataracts. (Roberts, 1994) The U.S. National Institutes of Health's National Eye Institute (NEI) supports population studies that examine trends in eye disease. (http://www.nei.nih.gov) For example, the results of a case control study including 356 adults ages 55-80 indicated that by increasing the dietary intake of carotenoids, especially from green leafy vegetables, the risk of Advanced Macular Disease is reduced. (Seddon, 1994) In yet another eight-year study of adult males in the United States supports the consumption of vegetable-based sources of lutein and zeaxanthin in decreasing the risks of eye disease. Lutein and Zeaxanthin are carotenoids that accumulate in the retina and ocular tissues, providing anti-oxidant effects and thus decreasing the risk of cataract formation. (Brown, 1999)

Another fat soluble nutrient found in collards is Vitamin K. The body's natural gut flora has the capability of synthesizing Vitamin K, however dark leafy greens like collards are the major source of Vitamin K for most people. Vitamin K is needed to support normal bone growth and optimal blood coagulation.

Vitamin K deficiency causes blood clotting disorders, lowers bone density and may contribute to osteoporosis. (Fairfield, 2002) The USDA currently has a clinical trial investigating the impact of Vitamin K intake on bone density and vascular health in older adults (age 60-80). The source of Vitamin K (Phylloquinone) for these trials is being extracted from collards and other *Brassicas*. (Wilhelm, 2004)

The Bs and Cs: The Water Soluble Vitamins

Water soluble vitamins are nutrients that are not readily synthesized or stored in the human body. These essential nutrients must be taken in through an optimal diet high in vegetables, fruits and complex carbohydrates.

Folate

Folate- a natural form of folic acid that is prevalent in all green foliage- is one of the eight members of the Vitamin B complex. Although some conversion of Folate is obtained through the metabolic processes that occur in intestinal flora, most must be obtained by eating folate-rich foods. Adequate intake of folate is necessary for the production of red blood cells.

During pregnancy, a good source of folate is needed to support the developing fetus's nervous system. A research study conducted by the University of New Castle in England, showed pregnant women with high folate levels increased the birth weight for their babies. "Low levels folate status in early pregnancy has been linked with low infant birth weight. Low birth weights are associated with health and developmental problems in early childhood including decreased IQ." (Reaney, 2005)

Folate also supports healthy cardiovascular system by mediating homocysteine – an amino acid that when left unchecked, can accumulate in the blood and damages vessels. Elevated levels have recently been recognized as a risk factor for CV [cardiovascular disease]." (Bliss, 2004)

The popular vitamin, Vitamin C has a stellar reputation for supporting the human immune system. It acts as a cofactor to other nutrients especially the enzymes hydroxylase and monoxygenase. It promotes synthesis and wound healing by supporting the production of collagen. Vitamin C also supports the production of carnitine that is used in cellular energy production. It is a vital co-factor for certain hormone production such as oxytocin and vasopressin. (Akhilender, 2003)

As an anti-oxidant, Vitamin C stimulates cellular necrosis of free radicals that are known to change the focus of cell structure and function, leading to tissue damage and many autoimmune diseases. (Fairfield, 2002) It also promotes phagocytic activity, reducing toxic nitrates, preventing the formation of carcinogens and subsequently decreasing the risk of certain cancers such as oral, esophageal, stomach and breast cancers. (Fairfield, 2002)

A Summary of the Minerals

Tiny in structure, minerals are mighty in function. Collards and most other green leafy vegetables are primary sources for calcium, potassium, magnesium and selenium in the human diet. These minerals support human life by: augmenting the synthesis and metabolism of cellular organic structure; stimulating ATP and ADP energy; assisting cardiovascular utility and oxygen transport; and promoting the phase I and phase II detoxification process and optimal renal function. (Marieb, 2000)

Collards' chlorophyll-rich dark green leaves are storage sites for minerals such as calcium, potassium, magnesium and selenium. The edible portion of collards also provides a source of fiber in the form of insoluble cellulose. It is the 'roughage' needed to support optimal bowel movement, transporting toxins out of the body. As an anti-carcinogen, the fiber of green leafy vegetables help to form bulky feces that increases transit time, binding carcinogenic toxins to assure optimal elimination. (Steinmetz, 1991) Vegetable fiber may also increase the acid pH in colon when metabolized by gut flora. "At low pH, the solubility of free bile acids is reduced thus diminishing their availability for co-carcinogenic activity. Fermentation of fiber may also lead to the release of bound calcium which would then be free to bind to free fatty acids and bile acids thus rendering these substances less damaging. Fermentation of certain fibers by micro flora in the proximal colon leads to the production of butyrate, a short-chain fatty acid that has been shown to be anti-neoplastic." (Steinmetz, pg 431)

For the average person, the leading (and usually one and only) known source for calcium is cow's milk. However, collards and other greens are a reliable source of this mineral. Calcium is a major biochemical in cellular energy exchange and therefore plays a role in blood pressure regulation. Calcium also enhances immune function by strengthening cell membranes.

In 2004, a study published in the *American Journal of Clinical Nutrition* supported calcium's role in bone maintenance. Fifty-four adolescent girls were analyzed for dietary intake of calcium. The young women that consumed three or more servings of fruits and vegetables high in calcium daily had greater bone density and therefore less risk of osteoporosis. (Tylavsky, 2004)

Of the popular dark green leafy vegetables, collards provide the highest readily absorbable concentration of magnesium. (Schwartz, 1984) Magnesium supports the function of coenzymes in the conversion of cellular energy ATP to ADP.

A vital mineral for optimal health, selenium acts as an antioxidant, supports vitamin E and is a constituent of certain enzymes. (Marieb, 2000) It is stored in the liver and kidneys, two major detoxifying organs in the body.

The amount of selenium in collards depends proportionally to the selenium content of the soil in which it is grown. Selenium is a vital mineral that acts as a cofactor for glutathione peroxidase, an enzyme that protects against oxidative tissue damage.

Known as Selenoglutathione, it suppresses cell proliferation, and reduces tumor growth which is especially important to cancer intervention and prevention. (Steinmetz, 1991)

Human and animal studies have demonstrated that selenium protects against several common cancers. Compared to placebo controls, supplementation of humans with 200ug of Selenium/day as Selenium-enriched yeast reduced overall cancer mortality by 41%, prostate cancer by 52%, lung cancer by 26% and colorectal cancer by 54%. (Keck, 2004)

Collards Essential Phytonutrient: Indoles

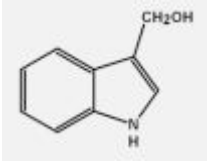
Indoles are nutrient supporters found in collards that work synergistically to assure healthy organs, and the primary constituent targeted in *Brassicas* for cancer research.

Glucosinolate
Glucosinolates (GS), a sulfur-containing compound, is a secondary metabolite that gives collards its pungent odor and taste. It also provides a natural defense mechanism for collards. (Keck, 2004)

The Indole, Glucosinolate (GS), and more specifically its derivative Indole-3-Carbinol (I3C), has garnered collards and other *Brassicaceae* popularity in cancer research. Indoles are formed and stored within the plant's myrosin cells. The plant enzyme myrosinase catalyzes glucosinolates. (Steinmetz, 1991). Once ingested by humans, indoles are release through the process of chewing and become bioactive through the metabolic processes of gut flora.

Indoles are considered cancer protective because of their ability to support the integrity of normal DNA structure and function. (Rose, 2004) Carcinogens, such as benzopyrenes, nitrosamines and aflatoxin, are known to impair DNA replication function and cause genetic mutation that lead to cancer causing tumors. Consuming foods that contain indoles like collards, is effective in preventing DNA damage and the development of certain cancers. (Rose, 2004)

In the human Phase I /Phase II detoxification process, glucosinolates inhibit the protein Cytochrome P-450's potential carcinogenic effects and potentiates the elimination of toxins from the body. (Drewnowski, 2000)



Indole-3-carbinol
Indole-3-carbinol (I3C) is a derivative of glucosinolate that is formed during the enzymatic process. When glucosinolates are released during normal food processing such as cooking or chewing, I3C is formed through enzymatic hydrolysis. I3C is

considered to be a primary ingredient responsible for the health benefits found in *Brassicas*. (Minich, 2004)

A benefit of I3C is its' ability to modulate estrogen production. High levels of certain estrogens are mediated by Cytochrome P-450 causing oxidative stress and damage to cells. A study of men and women given 7mg of I3C per day for a period of two months showed lower levels of estrogen metabolites excreted in urine, "decreasing the concentration of several metabolites known to activate the estrogen receptors." (Michnovicz, pg. 718) Lower estrogen levels may have a cancer preventative effect, especially on those cancers that are hormone mediated such as breast cancer. (Michnovicz, 1997)

Specific indications

Current research supports consumption of *Brassicas* for prevention of macular degeneration, bone loss, cardiovascular disease and a variety of cancers. In 1982, The National Research Council, Committee on Diet, Nutrition and Cancer specifically recommended that Americans increase consumption of cruciferous vegetables. It has been estimated that from 10-70 percent of all cancer is attributable to poor dietary habits, and that increased consumption of vegetables and fruits is protective against many types of cancers. (Steinmetz, 1991) such as lung, bladder, and prostrate, skin, stomach, colon, thyroid and pancreatic. (Keck, 2004) Cruciferous vegetables, more than any other fruit or vegetable, have a significant anti-cancer effect. (Keck, 2004) The American Institute of Cancer Research estimates that cancer rates could decline by up to 20% by simply adding five servings of fruits and vegetables per day. (Keck, 2004)

Current Research/ Studies/ Clinical Trials

Current research on collards and other Cruciferous vegetables are not only being conducted to support the dietary intake of such yet also to encourage the development of dietary supplements, in particular, the Indole, I3C.

Case control studies on dietary intake of *Brassicas* and cancer have been recorded since the early part of the 20th century. In eight case control study conducted in the 1950s, five of the studies showed lower risk of lung cancer in diets rich in leafy green vegetables (kale, spinach and other dark green vegetables) the lower risk associated with B-carotene. (Steinmetz, pg 329)

In 1989, the Eppley Institute for Research in Cancer and Allied Diseases reported the anti-tumor effects of collards and cabbage. Mice injected with mammary carcinomas were fed a diet enriched with both collards and cabbage. The results show a significant decrease in metastasis (tumor growth) in mice receiving the cruciferous vegetables. Diets with high collard intake were significantly beneficial to slowing tumor growth. (Scholar, 1989)

In 1991, the *Journal of Cancer Causes and Control* published a review of epidemiological literature on the relationship between vegetable and fruit consumption

and human cancer. (Steinmetz, 1991) 24 of the 115 case-control studies included cruciferous vegetable consumption and cancer. 71% (17 of 24) showed a negative effect between diets low in consumption and cancer; 13% (3 of 24) showed no effect between eating dark green vegetables and cancer and 17% (4 of 24) showed an increase in certain types of cancer when eating cruciferous vegetables (Steinmetz, pg 351) "In four of the studied, vegetable intake was found to be associated with lower risk of squamous and small-cell carcinomas than in adenocarcinomas and large-cell carcinomas…leafy green vegetables intake to be stronger for squamous-cell carcinomas." (Steinmetz, pg 329) "Among specific categories of vegetables, the results for cruciferous vegetables were the most striking, in that five of seven studies presenting finding for cruciferous vegetables, found higher intakes to be associated with lower risks." (Steinmetz, pg 332)

A research study including a cross section of the United States population represented by age, race, ethnicity, gender, socio-economic and health status measured the effects of folate and other Vitamin B complex on homocysteine levels. Homocysteine is associated with increase risk for cardiovascular disease and impaired cognitive function. (Ganji, 2004) Homocysteine is known to have a toxic effect on endothelial cells, increase smooth cell proliferation, increase LDL oxidation and increase thrombus formation. (Ganji, 2004) The study concluded 16.5% higher homocysteine levels in individuals who never consumed cruciferous vegetables. Individuals who consumed cruciferous vegetables had higher levels of serum folate and lower levels of homocysteine. (Ganji, 2004)

In another population study of individuals with first stage rectal cancer, consumption of fruits and vegetables- especially cruciferous vegetables- showed a decline in developing second to end stage rectal cancer. (Slattery, 2004) This risk was reduced by 30% when 5 or more servings of fruit and vegetables were added to the diet daily. (Slattery, 2004)

Collards and other folate-rich vegetables support the reduction of cataract formation. A ten-year study of over 2000 women showed a 10-15% reduced risk of cataract when vegetables like *Brassicas* were added and sustained in their daily diet. (Christen, 2005).

The Metagenics Institute for Functional Medicine, is a leading organization in the research for legitimizing the development of a dietary supplement from the Glucosinolate Indole-3-carbinol. In May 2004, the Institute published a position paper in support of I3C supplementation for chemoprevention. (Minich, 2004)

"At least nine human clinical trials within the past ten plus years" have been conducted on the health benefits of I3C supplementation particularly in women, reported Metagenics. (Minich, pg 3) "These studies were performed at reputable institutions such as the Boston University School of Medicine, New York University Medical Center, University of Pittsburgh Medical Center and Strang Cancer Prevention Center. The data for I3C are compelling enough that the National Cancer Institute has nominated I3C for testing as a preventative for breast cancer." (Minich, pg 3)

Metagenics' position paper further reports that "a balanced review of the literature on I3C reveals that most studies report inhibitory or chemoprotective effects of I3C in vivo.

However, as is common in these types of studies,- depending on the initiator, exposure protocol, and species- there are some animal studies demonstrating the promotion of cancer using I3C. Findings from these studies suggest that I3C has a protective effect if given after carcinogen exposure or tumor induction. Ultimately, the destiny of I3C…depends largely on several factors, including lifestyle, diet and duration and timing of exposure." (Minich, pg 3)

The Journal of Integrative Cancer Therapies published additional research in support of Indole-3-carbinol. The results of their findings agree that "I3C may lower the risk of hormone-dependent cancers by altering estrogen metabolism. In vivo, I3C inhibits estradiol-induced cell proliferation in estrogen-dependent cells." (Keck, pg 8)

The Journal's report also provides a proposed recommended dietary portion for I3C based on a clinical case study. "Intake of 300 mg I3C/day increased the 2/16 alpha-hydroxyestrone ratio in women at risk for breast cancer. I3C was given to women with cervical intraepithelial neoplasia (CIN)- a risk factor for uterine cervix cancer. After 12 weeks, more than 40% of the women taking 200mg or 400mg I3C/day experienced complete regression of CIN, but no women in the placebo group showed regression. In addition, women taking I3C had a dose-dependent increase in 2/16 alpha-hydroxyestrone ratio. Oral I3C provided patients with recurrent respiratory papilloma resulted in reduced or cessation of papilloma growth in 66% of the subjects. These results suggest that intake of I3C and crucifers rich in I3C may protect against hormone-dependent cancers." (Keck, pg 8)

Safety

Collards and cruciferous vegetables in general, are safe for consumption. As noted in the traditional literature, collard greens may cause mild digestive upset including bloating and flatulence.

There is a debate rising in the food industry regarding collard greens and other *Brassicas*. Food industrialists recognized that the average consumer does not like bitter tasting vegetables. In order to entice consumers to purchase more vegetables- and *Brassicas* especially, since they contain the highest levels of glucosinolates: the source of their "bitter" taste - the food industry is cultivating de-bittered vegetables. The debate arises because the phytonutrient being extracted from collards and other *Brassicas* is the very nutrient being studied in cancer prevention research.

Proponents for debittering vegetables tote studies that show high levels of glucosinolates having goitrogenic activity, causing thyroid cancer in dairy cattle and causing liver and kidney toxicity in other livestock. (Drewnowski, 2000). However, the average human consumer does not eat *Brassicas* at the level to cause toxicity. Although two current cancer research studies reported by the Journal of Cancer Causes and Control, show a minute correlation between consumption of cruciferous vegetables with higher amounts of thioglucosides and potential carcinogenic activity, neither of these studies' findings were statistically significant. (Steinmetz, 1991)

Preparation and dosage

The cooking and preparation of collards is as diverse and colorful as the human family. Traditional African-American cooking calls for hours long boiling with salt pork and cayenne pepper. Others in the community swear by vinegar. “I found the trick to collard greens is vinegar. They don’t taste good unless you drizzle in a bit of cider vinegar. That seems to bring out their flavor.” (http://www.almostvegan.com) Now, as a cornerstone of the food pyramid, cooking collard greens is considered more delicately to preserve its rich source of vitamins and minerals.

Two schools of thought prevail about consuming collards and vegetables in general to support health- especially in relation to cancer treatment: raw and cooked.

Eat ‘em raw
Current cancer research regarding the benefits of collards (vegetables) in the diet, finds that “the consumption of [such] in the raw form appeared especially beneficial.” (Steinmetz, pg 427) One factor may be that carotenoids are destroyed to some extent by heat. (Steinmetz, 1991) Vitamin C as well, “is labile to heat and oxidation and because it is a water soluble vitamin, can be lost in cooking.” (Steinmetz, pg 429) Raw enthusiasts usually juice collard leaves or add them to green salads.

Cook ‘em up!
Cooking or heating greens does extract more vitamins and minerals than merely chewing them raw. The traditional use of collards as “potlicker” (collard broth) for digestive upsets was made by boiling the greens.

Collards and other *Brassicas* in their raw form may contain higher amounts of goitrogens: thyroid suppressing agents. Heat destroys these constituent properties. Cancer patients are known to have under active thyroids, so cooked collard greens may provide the better alternative to raw in such cases. (Yance,1999)

See the appendix for a variety of recipes for preparing collard greens from around the globe.

Commercial sources 

Collards are cultivated throughout the United States, however are most prevalent in the Southern states. Collards are cultivated as different varieties; Vates, Georgia-Hicrop, Heavicrop, Blue Max, and Morris Heading, etc. Vates and Georgia-Hicrop are the most commercially popular variety.

Collards and *Brassicaceae* are known to cross-pollinate within species. This process was encouraged naturally, through early cultivation of domesticated plants from the wild. Early farmers would cultivate crops that yielded specific qualities through a process called introgression. Therefore, species like *Brassica oleracea L*. has many varieties, including collards, cauliflower, broccoli, Brussels sprouts and kohlrabi. (Johns, 1996) Local variations of *Brassicaceae* (and collards too!) were further mixed with the European variety and thus the American "Southern Georgia" crop was born. To this day, farmers and seed producers take care when cultivating these crops. The USDA recommends planting collards away from other *Brassica* species in "isolation distances of at least ½-1 mile. Minimum population sizes from all *Brassicas* should be at least 100 plants." (*Brassica* production. http://www.ars.usda.gov)

Collards may be planted year round, however fall planting and winter harvesting produce higher quality, better tasting and more nutrient-rich plants. Whereas hotter temperatures stimulate the bitter qualities of collards, they tend to thrive in the colder seasons. "Cool growing weather, fall frosts, and mild winters impart a high sugar content and fine flavor." (http:://aggie-horticulture.tamu.edu)

Collards, like other *Brassica*, require insect pollinators to germinate its flowers. They are susceptible to other types of pest: i.e. Cabbage Loppers.

Sow seeds ¼- ½ inch deep; 6-12 inches apart in rows 3 feet apart. Collards thrive in rich, fertile soil that is slightly acidic: pH 5.5-6.5. Hearty crops thrive in moist soil with good drainage. Moisture assures that the plant extracts nutrients from the soil. Plant crops in full sun.

Cropping mature leaves and allowing younger leaves to continue to grow or cutting down the entire plant and removing leaves can harvest plants. Plants take about 75 days to mature.

And for the herbal scientists interested in cultivated collards for medicinal purposes, please note that concentrations of the primary therapeutic constituent, glucosinolate vary

between plants and are affected by environmental conditions such as climate and soil quality. Soil rich in sulfate produce plants with increased concentrations of Glusosinolates. (Keck, 2004)

Appendix

Introduction

The family of *Brassicaceae* is one of the oldest recorded living groups of vegetation on the planet earth. On virtually every continent, there is a member of the *Brassica* lineage. Collard greens or *Brassica oleracea (variety) acephala*, is definitely one of the family members that rank Methuselah status, with origins being recorded as far back as Confucius and the Chou Dynasty (Trager, 1995).

With such an enduring history, the *Brassicas* have been providing mankind with sustenance since recorded time began. They were and remains a revered vegetable, having once been referred to as *Cruiferaceae*- a name chosen to depict its physical signature- a flowering presentation in the form of a cross or "crucifix." African, European and Native American populations utilized collards medicinally for headaches, hangovers and digestive upsets. (Moerman, 1998)

Of all the *Brassica* family tree, Collards carry the most noted affinity to a specific race of people or culture. Everybody eats its kin broccoli, cauliflower, cabbage and kale. Although we may think "Asian" and bok choy, the association of such doesn't leave one all warm and fuzzy inside like "Black folks" and collard greens does. And this includes Black folk in general, not simply African-Americans. In the West African nation of Kenya, Collards remain a staple for the common people and are affectionately called, "Sukuma Wiki"- "pushing through the week"- meaning having some collards guarantees your family will eat. In South America, "Couve" or collards are an Afro-Brazilian mainstay, as are "col berza" in Afro-Cuban culture and "couve-galega" in Cape Verdian and other Black Portuguese heritage.

The tragic chapter of this story is that each of these cultural groups of Blacks, are the descendents of the European slave trade. Brothers and sisters of one continent, find themselves helplessly dispersed throughout the planet against their will. However, what will was left intact in Black people, proved worthy to support their survival, and the story of the collard green walked with them throughout history, supporting their livelihood with sustenance and an economic commodity.

The Culture of Collards

The 21century finds collard greens as endearing a plant as ever there was. How do you know that you 'be down in the 'hood'- meaning the coolest of the cool between your race and culture? Why call yourself "Collardgreens" as the rap artist, Adrian Taylor of South Carolina does. Other Rap groups, such as Eightball & MJG, Black Pohaic, and JOMICO also croon to musical cuts that include the theme "Collards." Even though the language of their lyrics leaves a strong desire for parental discretion, the musical ideal carries collards as a cultural icon. Another example is the Grammy Award Winner, Anthony Hamilton, who depicts the harsh reality of the black cultural neighborhood scene in the lyrics to his song, *Cornbread, fish and collard greens*.

Contemporary Black literature also includes the notion of collards as a representation of the culture. A recent episode of the popular cartoon-Boondocks entitled *Cornbread, fish*

and collard greens, provided a satirical look at the Black-American diet. In 2003, a popular Off-Broadway play was written to open a dialogue about inter-racial dating between Black and Latino cultures- *Platanos and Collard Greens*. The playwright, David Lamb, chose two popular cultural foods to represent their respective cultures and to add humor to a sensitive topic. "Platanos and Collard Greens is a thought provoking romantic comedy that tactfully addresses stereotypes, prejudices and urban myths that exist between African-Americans and Latinos, within the context of Hip-Hop, humor and satire. The play impels the audience to evaluate pervasive stereotypes." (www.platanosandcollardgreens.com).

A new novel entitled, *Collard greens and caviar* written by L. Breezee Harris, highlights the struggle within Black culture on a soci-economic level. The American Educational Research Association's 2004 Annual Meeting, featured a curriculum performance workshop entitled, *Collard Greens, Cornrows and Feminism* to showcase Black women's cultural struggle "in relation to concerns about white feminist discourse, popular culture and sexuality." (http://convention.allacademic.com)

Around the United States, there are annual cultural and neighborhood festivals that have collards as their mascots. In East Palo Alto, California, The Collard Greens Cultural Festival is in its seventh year of celebration and people from around the United States travel to the Northern California city to enjoy the festivities. The festival features a unique one-of-a-kind homemade ice cream: collard green flavored! Most of the southern states too, have one form of harvesting or homecoming festival that features a collards growing or cooking contest.

As the age of cultural tolerance and the ideal of one human family blossoms, the warm and fuzzy, 'collard greens equals mom and apple pie' begins to embrace many races and cultures.

Carson "Collard Greens' Hughes, a Caucasian gentleman from the south, was recently featured on the Steve Harvey television show for his feat of consuming the most collards in the shortest amount of time: 2.5 pounds in 17.5 seconds! Across the globe in the great country "down under"-the Blues Band, Collard Greens and Gravy of Australia, is gaining notoriety as the Blues band to be reckoned with. Todd Collards, ("Mr. Collard Greens"), a Caucasian teacher from Louisville, Kentucky, adds pun to his name to keep his students delightfully engaged in learning. Even a self confessed hillbilly, C. Bowles, writes a true confession on his blogger site, *Can you hear me now?* - "Collard Greens- where have you been all my life?"

"So I suppose I'm not the REAL hillbilly that I've bragged about being for so long. How could any self-professing Hick have lived the sheltered life required to exist on this earth, in this culture, with these roots for 64 years and only now have their first taste of Collard Greens?" (http://canyouhearmenow.typepad.com)

How did a simple plant that grows seemingly absent-mindedly and profusely on nearly every continent on the planet earth become so endearing to mankind as to develop its own cultural identity? Possibly because collards-and *Brassicas* in general- has always

been a good all-around medicinal plant and economic commodity, and a key staple for the nutritional survival of Blacks.

Collards are one of 3000 species within *Brassicaceae* found around the world, and may be one of the oldest known cultivated food crops. Anthropologists agree that early Man (Neanderthal) survived on vegetation mainly until he acquired sufficient skills for hunting flesh. Man's diet required a "dietary sources for vitamin C." (Trager, pg 1) "Without enough Vitamin C (abundant not only in citrus fruits, peppers, and cabbage [*Brassicacaeae*] but also in animal organ meat), humans cannot synthesize collagen, the adhesive protein substance that holds cells together, and without collagen, their wounds do not heal, old scars may burst open, and they may exhibit symptoms of scurvy." (Trager, pg 1)

A hybridized version of wild cabbage, collards may have originated in Asia Minor or Turkey. European Ethno botanical researchers trace the cultivation of collards as early as the first century. The Greeks and Romans are the first known commercial cultivators of the crop and introduced it to their European neighbors in France and Great Britain. In 1558, "Flemish weavers fleeing the persecution of Spain's King Phillip II" introduced members of the *Brassica* family to England. (Trager, pg 97) "However, collard greens subsequently spread over much of the tropical and subtropical world and are cultivated today in Southeast Asia (including Southern China), East and West Africa, the West Indies, South America and the southern United States." (Kiple, pg 1761)

During the 1600s, the Europeans turned colonialists, brought collards to the Americas believing that the hearty staple would prove beneficial, as the new land's food source was still a mystery. In 1773, Thomas Jefferson "experimented with European foods" by planting them in his own family farm. (Trager, pg 172). Agriculture became a major economic base in the new found-land. Three years after Mr. Jefferson began his own agricultural venture, the Scottish philosopher, Adam Smith includes *Brassicas* amongst the agricultural commodities to "promote natural liberty, trade and commerce" in his treatise, Inquiry into the nature and cause of the wealth of nations. (Trager, pg 175)

By the 19th century, *Brassicas* were staple vegetables in America. In 1828, Eliza Leslie's popular cookbook, Directions for Cooking included the cooking tip- "Ham should always be accompanied by green vegetables [including] cabbage [*Brassicas*.]" (Trager, pg 175).

The European diet also influenced the Native people of the Americas. "Plants brought to the Cherokee lands by African [slaves] or European settlers were added to the people's diet. [Collards] and many others got onto the menu in this way…forming the staples and mainstay of the Cherokee diet. (Hamel, pg 18)

Although the cultivation of certain vegetables like collards and *Brassicas* had an agricultural economic benefit, "historically, the consumption of particular vegetables and fruits has been believed to bring healthful benefits. In fact, early medicine revolved largely around the prescription of specific food concoctions for certain ailments."

(Steinmetz, pg 325) So much so, the contemporary research on food-as-medicine is based on "both past concepts and contemporary interest in nutrition." (Crellin, pg 131)

In early 17th, 18th and 19th century societies, it is believed that "Cruciferous vegetables were cultivated primarily for medicinal purposes and were used therapeutically against headache, deafness, and diarrhea, gout, and stomach disorders." (Steinmetz, pg 325)

African ancestry maintained a spiritual view of health and therefore relied on plants for medicine as plants too had spirits. "Africans believed that good health arose from harmony with nature and other people; poor health from discord. Sicknesses could stem from the curses of others, deviance from religious rectitude, or conflict with the natural environment. The culture of African folk medicine was, and is, often conducive to healing. Faith and trust are essential ingredients for recovery, whether in modern medicine or so-called magical cures." (Appiah, pg 759).

Two recorded used for collards in traditional African medicine supports its universal used in digestive upsets. The plant sap was drunk as a soothing remedy for gastric ulcers (upsets). For individuals troubled by tapeworms: "One handful of female flowers (male are inactive) is ground, macerated in a cup of hot water for 5-10 minutes and is drunk until it is effective or powder of 4 large leaves is ground in ½ liter of cold water and drunk (very effective!)" (Dieter, pg 429-430)

The Native American Cherokee were noted to use collards as a "Dermatological Aid. Poultices of wilted [collard] leaf were used for boils. Poultice of green leaves were bound to head for headache." (Moerman, pg 128) The Rappahannock Native Americans of the Pacific Northwest used collards as a natural sunscreen. "Leaves worn under the hat to protect from a strong sun." (Moerman, pg 128)

The 17th century English horticulturalist and herbalist, John Gerard, included the medicinal use of *Brassicas* in an early botanical text entitled: <u>The Herbal or General History of Plants.</u>

> *All the colewoorts haue a drying and binding facultie, with a certaine nitrous or falt quality, whereby they mightily cleanfe, either in the iuice, or in the broth.*
> (Gerard, pg 317)

Gerard described the use of collards descendents as a bitter remedy for digestive upsets "for which cause the decoction thereof sooth the belly and doth also the juice of it if it be drunke." (Gerard, pg 317). Gerard also notes collards other "virtues" as a remedy for the following: jaundice and "cankers in the eyes", shaky pallets and a host of digestive problems that caused inflammation, hot swellings and troubled spleen. (Gerard, pg 317). The Juice of the greens were also recommended as a cure for hangovers: "the raw colewoort being eaten before meate, doth perferue a man from drunkennefle: the reason is yeelded, for that thre is a naturall enmity betweene it and the vine, which is fuch, as if it grow neere vnto it, forthwith the vine perifheth and withereth away: yea, if wine be

poured vnto it while it is in boyling, it will not be any more boiled, and the colour thereof quite altered." (Gerard, pg 317)

Collards began losing its medicinal popularity because of one annoying quality: flatulence. "In 1729 the author of The Family Companion for Health noted: 'Cabbages are a loosening plant, but they disturb and puff the stomach: they are said to be useful in broth after a debauch, because they contain a good deal of watery and slimy juice which is also a little fetid and bitter, and this helps to prove laxative and diuretick." (Crellin, pg 131)

Collard greens remained an agricultural commodity because it was inexpensive to grow and harvest. Originally cultivated for animals and other farming livestock (Kiple, 2000), collards doubled as a food source used to feed the Black slaves. Legend has it, that Blacks hid collards amongst themselves to sustain them through the journey of the middle passage across the Atlantic Ocean. More likely, Africans were introduced to the actual species of the American collard green variety when they arrived. Since its taste was similar to *Brassicas* on the African continent, collards became an easily adopted staple.

It is from this tradition that African-Americans acquired a taste and affinity for the *Brassica oleracea L*. variety now known as collard greens. "Slave owners, who usually scorned continuations of African culture, usually permitted slaves to practice traditional medicine. Folk cures absolved them of the responsibility to pay for a white physician." (Appiah, pg 759). During the Diaspora experience, Blacks truly looked to collards as their "Sukuma wiki"- the food that pushed them and sustained them through the week, months, years and centuries.

The soul food diet helped Black folks to survive during their years of hardship in America: through slavery and through the depression. But there are a few interesting observations to be made. First, during slavery, the vegetables grown or gathered were organic. Slaves didn't have all the pesticides and chemical sprays which infect the vegetables used for soul food menus today. Secondly, meat was not the predominant item on the menu during slavery or the depression. Meat was a luxury. (Gregory, pg 80)

Although sufficient to sustain life, the original Black cultural diet was not optimal. Black slaves were forced to subsist on table scrapes and garbage. "Food, which was issued once a week, was generally coarse and lacking in variety. Each adult [slave] was given a peck of corn and three to four pounds of bacon or salt pork." (Bennett, pg 74)

For centuries, African-Americans embraced poor dietary habits out of necessity. Although collards and other vegetables may have been good sources of important vitamins and minerals, the culture of the Black kitchen was to laden their greens with the cheap saturated fat, pork, and to over-cook their vegetables to discourage the tough, fibrous texture.

During the Emancipation era and beyond, Black cultural knowledge and education increased. The history of Black health became synonymous with socio-economic status. African-Americans who were able to endure a lifetime of poor diet due to the rigors of manual labor, became acquainted with contemporary lifestyle diseases. Two great influences on the nutrition and health education in Black culture are Dick Gregory and the Honorable Elijah Muhammad. Gregory's Natural diet for folks who eat: cookin' with mother nature was published in 1973, the time that he embraced vegetarianism, an anomaly in the Black community at large. Dick Gregory wrote about the influence of diet on lifestyle during a critical period where the statistics of Black health began to turn downward as their socio-economic status turned upward.

Look around the black community and you will quickly see the effects of the soul food diet. Count the bloated stomachs, the bald heads, the varicose veins, the swollen ankles. Listen to the complaints of high blood pressure, heart trouble, nervous tensions, etc. All these are the result of heavy starch consumption, cooked food and greasy fried food consumption, and sugar and salt consumption. One might say folks with all those difficulties are suffering from consumption! (Gregory, pg 80)

Beginning in the 1930s, the Honorable Elijah Muhammad led this charge through his teachings and a series of writings called, How to eat to live. It was Muhammad who first openly discouraged the use of pork in Black diet as well as other "cheaply raised foods" including collards, as a means of empowering Black people to take charge of their livelihood. (Muhammad, 1967) "Peas, collard greens, turnip greens, sweet potatoes and white potatoes are very cheaply raised food," the Honorable Elijah Muhammad writes in How to eat to live, vol. 1. "The southern slave masters used them to feed the slaves and still advise the consumption of them. Most white people of the middle and upper class do not eat this lot of cheap food, which is unfit for human consumption." (Muhammad, pg 5)

Gregory and Muhammad's concepts continue to influence healthy dietary changes in African-American culture. Modifications to soul food recipes, including collard greens, are present in popular health books and magazines like, Eat Right for you Blood Type and Vegetarian Times. Lindsey Williams, the grandson of "Harlem's queen of soul food, Sylvia Woods" re-scripted the infamous black cultural diet after years of debilitating health from obesity, diabetes and hypertension. Williams' cookbook, Neo Soul, " takes soul food to a whole 'nutha level," scraping lard, pork and salt from traditional cultural recipes (including collard greens) adding substitutes like olive oil, soy products and natural herbs and spices. (Williams, 2006)

As the American health crisis grew and continues to grow for people of all cultures who have adopted the sedentary lifestyle, the medical community's research supports the age-old knowledge: good diet equals good health. As research becomes increasingly more scientific, traditional knowledge becomes quantifiable through the assistance of biochemistry.

Studies of healthy individuals' food choices are being conducted and analyzed. "As a result of many studies showing inverse associations between dietary intake of crucifers

and cancer, the National Research Council, Committee on Diet, Nutrition and Cancer specifically recommended in 1982 that Americans increase consumption of cruciferous vegetables." (Keck, pg 6) In addition, the constituents of collard greens and other *Brassica* species are currently being researched as potential sources of disease prevention and intervention such as macular degeneration, osteoporosis and cancer. Collards, the vegetable that proliferates worldwide, feeding mankind since prehistoric time, comes full circle as it continues to support life as a cultural mainstay for all.

Glossary of Physiological Actions

Antioxidant-"an enzyme or other organic molecule that can counteract the damaging effects of oxygen in tissues. Although the term technically applies to molecules reacting with oxygen, it is often applied to molecules that protect from any free radical (molecule with unpaired electron.)" (http://chemistry.about.com/library/glossary/bldef350.htm)

Anticarcinogen- "a substance or action that prevents or delays tumor function." (Thomas, pg 118)

Phytoestrogenic-"phyto [or plant] chemicals which have estrogenic activity. Compounds belonging to several phytochemical classes interact with estrogen receptors." (Mills, pg 54)

Nutritive- "the process of assimilating foods; having the property of nourishing." (Thomas, pg 1337)

Anti-tumor- "Anti-cancer is a term reserved for materials that are toxic to tumor cells in clinical trails with humans. Anti-tumor activity occurs if cytotoxcity demonstrate in the laboratory also occurs in tumor cells in living animals." (Hoffman, pg 457)

Hepatoprotective- Chemical agents that protect liver or hepatic cells. "Anti-hepatotoxic agents appear to work through a combination of two main mechanism: Alteration of cell membranes so that only small amounts of toxins may penetrate into the cells; and acceleration of protein synthesis, with a subsequent stimulation of cell regeneration." (Hoffman, pg 176)

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