Tea is a journal of the Tea Research Institute. It is published twice annually, in July and December, by the Tea Research Institute (TRI), P.O. Box 820-20200 Kericho, Kenya, e-mail: Director.Tri@Kalro.org, website www.kalro.org and www.tearesearch.or.ke.

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The January to June, 2016 weather in the west of Rift Valley showed considerable difference from the long term pattern, (Table 1) especially the rainfall distribution. The month of January received almost twice as much rainfall as the long term average. April and May also received more rainfall than the long term average. Soil Water Deficits (SWD) were recorded in the months of February and March, however, cumulatively the season had no SWD. There was no frost incident reported during the period under review but twenty three hail incidences with an accompanying crop loss of 190,076.13kg made tea were reported in West of Rift compared to 19 incidences with a loss of 121,668.67 kg made tea reported in the same season the previous year (Table 2). Kericho experienced a heavy hail downpour on 3rd May 2016 that lasted in the Tea Research Institute fields for up to 2 days (Plates 1 & 2). The tea recovered in approximately two months. The rains during the period were favourable for plant growth and good rains resulted in a 10.73% national increase in tea yields (Table 3) compared to same period the previous year. While Trans-Nzoia County led with a 120.38% yield increase this year, Meru County recorded only 18.54% yield increase. West of Rift recorded higher increase than East of Rift at 53.78% and 27.07% respectively, from the previous year. The improved production can be attributed to the favorable weather conditions during the period under review and adoption of good agricultural practices among tea farmers in the country.
CHALLENGES IN MAINTAINING TEA QUALITY

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ABSTRACT

Tea (Camellia sinensis (L.) O. Kuntze) is an important cash crop contributing to economic wellbeing and wealth in many developing countries. The crop creates employment opportunities and development in the rural areas in addition to generating foreign exchange. Tea beverages are the second most consumed fluids after water. For such a widely consumed product, quality maintenance is of utmost importance. Quality tea refers to tea with components that are desirable to the market and that does not subject consumers to health risks. Such quality criteria should be based on “reliable, measurable and reproducible” parameters, verifiable through independent analysis. For black tea, the ISO 3720 developed, set limits on water extract, total ash, water soluble ash, alkalinity of water soluble ash, acid soluble ash and crude fibre but excluded moisture content though required that tea shall be clean and reasonably free from extraneous matter. It was also deficient on the chemical parameters requirement. The late 1970s, United Nations Conference on Trade and Development (UNCTAD), “Minimum Export Standard for Tea” limited as follows: water extract (≥ 38%), theaflavins (≥ 6 µmol/gm), crude fibre (≤ 12 %), moisture content (≤ 5.99%) and optional ash tests of ISO 3720, to check on adulteration levels. The standard required testing for unacceptable levels of taints or odours, to be determined through advice of panel of tasters and introduced theaflavins content as the reliable quality parameter for black tea trade. From the catechins in green tea leaves, the total theaflavins per se may not be critical in quality, but rather the contribution of the individual theaflavins in the mix. With development of advanced analytical techniques, it has been possible to quantify the amounts of individual theaflavins in black tea and to develop an astringency normalising factor “theaflavin digallate equivalent (TFDG equiv.)”, which has shown remarkable significant relationship with sensory evaluation for both Kenyan and Central African black teas. It is therefore a reliable parameter for assessing black tea quality. The catechins composition are cultivar specific. It is therefore possible to select cultivars for high quality black tea through green leaves catechins composition. Insect pests pose major production problems in many tea producing countries, leading to substantial losses. To mitigate such losses, there is widespread use of insecticides. This leads to enormous pesticides residue in tea that causes rejection of tea in the importing countries. This has been a major importation challenge especially in the European Union countries where stringent maximum residue limits have been set for several pesticides and their byproducts. This situation is likely to worsen with the increasing global warming. It necessary to seek environmentally friendly ways of mitigating the insect infestations. In seedling tea plantations, or mixed clonal fields, some plants are susceptible to pest infestation while others are tolerant or avoided by the pests. This suggests that tea individual tea plants/clones may have mechanisms of either attracting or repelling the insect pests and that such mechanism is cultivar dependent. Volatile compounds have been implicated as odour cues for insects. Analysis of overhead volatile composition of live tea plants demonstrated that the compositions vary with cultivars and that such variation can be related to pest infestation levels. Some overhead volatile compounds however, repelled the mites while others were attractants. These results suggest that overhead volatile compounds composition can be used to predict pest tolerant/susceptible cultivars. It is therefore possible to formulate safe tea-based pesticides using the volatile compounds biosynthesised by the tea plant.
SOcio-economIc dynAmIcs Influencing diversIfIcatIOn of fArmer’s croppIng enterprIses: a casE studY of kiegoi tea cAtchment

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abstract

Agricultural production in smallholders’ farms in Kenya is characterized by mixed cropping systems and low mechanization. A study was conducted to determine the factors influencing the enterprise choice among smallholder farmers at Kiegoi catchment, Meru County. Data for the study were obtained from 150 randomly selected farmers in three electoral areas in December, 2015 using pre-tested structured questionnaires. Data were then analyzed using simple descriptive and inferential statistical analysis. Results of the study revealed that all the respondents practiced mixed cropping. Further, crop diversification scheme faces constraints especially in the context of small farm holders. Farmers should therefore be encouraged to form co-operative societies so as to capture the opportunity for loan access from financial institutions and leverage on economies of scale.
ABSTRACT

The importance of smallholder tea farming and its contribution to the economy in developing countries cannot be gainsaid. The smallholder tea farmer in Kenya account for 60% of the total tea production with an average farm size of less than 0.5 ha. A study was carried to determine the influence of farm size on returns to the smallholder tea farming in Kenya. This paper is based on both interpretivist’s and positivist’s epistemology and informed by data collected from 6 Counties in Mt. Kenya Region and 104 respondents around 15 KTDA managed factories. Analysis on perception on Government intervention suggested that the government has low influence on tea farmers’ welfare. The study also found out that returns to farmers are determined by size of land under tea. It is therefore recommended that concerted efforts by all the relevant stakeholders in addressing the smallholder tea farmers’ challenges for sustainable production.
NUTRITIONAL AND GEOGRAPHICAL ASPECTS OF TEA AS AN IMPORTANT TOOL IN TEA VALUE ADDITION

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ABSTRACT

The global trend for black cut, tear and curl (CTC) tea which is mainly produced in Kenya has been on the decline calling for value addition and product diversification for sustainable tea production. Tea value added products in Kenya account for about 15% of the total exports, earning the country less per volume compared to other countries. An important value addition aspect in tea is blending with varying nutritional values for different markets. International markets prefer teas from particular regions mainly due to their unique quality attributes thus creating huge price disparities of tea grown in the same country. This study therefore entailed determination and correlation of nutritional (Ca, Mg, Mn, Zn, Cu, Vitamin A and C) and edaphic aspects (pH and minerals) affecting manufactured teas from different agro-ecological zones in Kenya. There were significant (P≤0.05) differences in mineral nutrients, caffeine, tannins, Vitamins A and C in made teas from different tea agro-ecological zones with soil pH playing a major role. The unique quality characteristics associated with different agro-ecological zones could be used for assigning tea products geographical indication (GI), blending and pricing of such teas for niche markets.
ABSTRACT

Tea plant (*Camellia sinensis*) is an important cash crop in Kenya earning the country about USD 1 billion annually in forex. It is also a major source of natural polyphenols attributed to the unique properties of tea. Such properties include health benefits, antimicrobial and nutritional. An important application of these polyphenols is in crop protection, where they have been observed to inhibit microbial growth. However, most botanical extracts have limited efficacy due to photo lability and oxidation effects. In this study, tea extracts were intercalated in chitin polymers to enhance the inhibitory effect of the complex on bacterial wilt causing pathogen (*Ralstoniasolanacearum*) which is a serious disease pathogen that can cause up to a 100% crop loss in serious infestation. Chitin was ground into powder of 0.1 mm size and tea extracts from green, purple and black cut-tear-curl (CTC) tea adsorbed through a rotary evaporator. Confirmatory tests on effective adsorption were done using FTIR and XRD, while bioassay experiments were performed to determine efficacy of the crude tea extracts intercalated-chitin (CTEIC) on inhibition of *R. solanacearum*. Accelerated and slow tea extracts release experiments were used to show the stability of the compound. During characterization there were notable shifts in the spectra and diffractograms from FTIR and XRD respectively indicating successful loading of the tea extracts in the polymer attributed to the large interlayer spaces and functional groups. Moreover, release experiments demonstrated significant (p<0.05) reduction in volatility of the intercalated compounds when exposed to elevated temperature. There was significant (p<0.05) inhibition of *R. Solanacearum* by 66% while optical densities (OD) were also significantly (p<0.05) reduced from 3.05 to 1.74 when CTEIC was used. The study therefore recommends utilization of tea extracts intercalated-chitin as an effective and environmentally safe pesticide for the devastating bacterial wilt pathogen.
ANTIMICROBIAL PROPERTIES OF COSMETIC PRODUCTS DEVELOPED FROM KENYAN TEA EXTRACTS

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ABSTRACT

The use of natural products in cosmetics has been practiced for a long time due to low mammalian toxicity. Different plant parts such as leaves, roots, cell sap, barks and seeds have been used as sources of phytochemicals in the cosmetic industry. Their use in skin care products is based on the premise of free radical scavenging, anti-inflammatory, anti-aging, photo-damage protection and antimicrobial properties. Tea, Camellia sinensis, has recently been used in the formulation of these cosmetic products. It is rich in polyphenols, mainly catechins in green tea, theaflavins in black tea and anthocyanins in purple tea. In this study, extracts from green, black, and purple tea and tea seed oil were utilized in the manufacture of bar soaps, shampoos, conditioners, lotions and detergents. Antimicrobial studies of the products were carried out to compare the activity of active ingredients in the products. Results showed that purple tea products had significantly (p<0.05) higher inhibitory effect on microbes followed by green and black tea products. This study demonstrates that Kenyan tea extracts can be used to manufacture high value fast moving consumer goods hence enlarging the market for Kenyan tea and contributing to stabilizing producer prices, creating skilled jobs and wealth creation.
BIOCHEMICAL DIVERSITY OF KENYAN TEA CULTIVARS AND POTENTIAL USE IN PROCESSING OF DIVERSIFIED PRODUCTS

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ABSTRACT

The Kenyan tea industry is the largest agribusiness and a major foreign exchange earner to the economy. However, the tea is sold as a bulk raw product with little or no product diversification causing a decrease or stagnation of market prices. Interventions to expand market outlets can be driven by product diversification and differentiation, value addition and novel marketing strategies. Such endeavours should be preceded by the extensive characterization of tea cultivars to identify biochemical properties that can putatively enhance their nutritional potential. Leaf samples of 204 tea accessions conserved at Tea Research Institute, Kericho and Kangaita Centres, were obtained and assayed for total polyphenols, catechins, caffeine, anthocyanins, chlorogenic acid and theanine using reverse phase High Performance Liquid Chromatography. There were significant differences (P<0.05) in total polyphenols (16.4% - 30.9%) and total catechins (11.03% - 25.42%). A total of 46 cultivars had phenolic composition higher than cultivar TRFK 6/8 that was used as an internal reference standard. Cultivars with low polyphenolic content were chinary type (sinensis) preferred for processing high quality green orthodox or CTC teas, while the medium and high polyphenolic content were predominantly assamica suitable for oolong and black orthodox/CTC teas. Based on levels of individual catechins ECG and EGCG, 15 cultivars were found suitable for the manufacture of theaflavin-3, 3'-digallate rich black tea. Cambod varieties, TRFK 301/5 and TRFK 301/4, had high EGC/EC and low EGCG/ECG ratios indicating suitability for manufacture of less astringent green orthodox teas, whereas cultivar TRFK 687/1 had least caffeine contents at 1.96. Cultivars assayed for chlorogenic acid and theanine identified AHP SC 31/37 and TRFK 6/8 having highest contents at 0.13% and 1.7%, respectively. The inclusion of these phytochemicals as novel quality markers would help brand and market Kenyan tea products.
EMERGING OPPORTUNITIES FOR TEA PRODUCT DIVERSIFICATION FROM KENYAN TEA CULTIVARS


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ABSTRACT

Tea is the most consumed drink in the world. It is largely consumed as black, green or oolong tea beverage. Kenya is currently the world’s largest exporter of black tea. Due to overproduction, the unit prices of processed tea have either stagnated or decreased despite increasing costs of production resulting in decreasing returns for tea growers. There is need to explore alternative uses of tea in order to grow the demand for the crop’s products and shore up market prices. Product diversification through value addition is an important approach to ensure enhanced returns to growers. The tea beverage is a source of dietary polyphenols which have been associated with numerous health enhancing properties. Tea germplasm however differs significantly in its biochemical make up. The scope for diversification of tea products is therefore dependent among others on the availability of appropriate germplasm with ability to produce the right raw material for production of high value diversified tea products. Though the tea species is not native to Kenya, the country’s germplasm is diverse and efforts have been made to enlarge the existing genepool through introductions from other centre’s of origin and dispersal and also to generate intra- and interspecific hybrids with the potential to produce tea products with unique properties. This paper reviews the potential to enhance the range of tea products that can be processed from Kenya’s tea germplasm.
DISTRIBUTION OF TEA WEEVILS (CURCULIONID SPP.) IN MT. KENYA REGION

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ABSTRACT

Two major curculionid weevils, Entypotrachelus meyeri [Micans/Kolbe] (commonly known as Kangaita weevil) and Sphrigodes mixtus [Hustache] (commonly known as Nyambene weevil) defoliate tea bushes affecting production. A survey was carried out on distribution of weevil species in Mt. Kenya region. Five (5) farmers with infested tea fields were purposively selected and geo-referenced from 10 KTDA factory catchments. The study revealed that the distribution of the weevil species was site specific for E. meyeri but not for S. mixtus. The most prevalent weevil was the S. mixtus occurring in 5,135 ha against E. meyeri in 1,231 ha. The least infested areas were Kimunye (822 ha) followed by Mununga (859 ha) infested by a mixture of curculionids weevils (Otiorrhynchus morio, E. meyeri, S. mixtus and Armadilo spp). Most (90 %) of the tea farmers interviewed had experienced pest problems associated with weevil’s damage and some in addition to other pests. All the large farms (>4.4 ha) had weevil infestation. From the study, it can be concluded that integration of agroecosystem in tea farming is the most suitable practice in assuaging heavy pest infestations arising from climate change phenomenon.
GENETIC RELATEDNESS AND BREEDING HISTORY OF AFRICAN TEA GERmplASM
BASED ON NOVEL MARKERS

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ABSTRACT

Africa is a major tea producer worldwide. Despite the economic importance of tea in the continent, scanty information exist on its genetic diversity in totality. Twenty-three (23) nSSRs and 3 plastid DNA regions were used to investigate the genetic diversity, relationships and breeding patterns of tea accessions collected from eight countries in Africa. A total of 280 African tea accessions generated 297 alleles with a mean of 12.91 alleles per locus and genetic diversity (Hs) estimate of 0.652. STRUCTURE analysis suggested two main genetic groups corresponding to the two tea types Camellia sinensis var. sinensis and C. sinensis var. assamica, respectively, as well as an admixed “Mosaic” group with individuals defined as hybrids of F2 and BC generation of C. sinensis var. assamica maternal parents. Accessions known to be C. sinensis var. assamica further separated into two groups, representing the two major tea breeding centres of Southern Africa and East Africa. This suggests that some traits of the variety and their associated genes underwent selection during geographic differentiation or local breeding resulting in relatively lower genetic diversity. The data confirmed international germplasm exchange/movement among countries within Africa. This is the first step towards effective utilization of differently inherited molecular markers for exploring the breeding values of African tea. These findings will aid the planning for exploration, utilization, and conservation of tea germplasm for future breeding in Africa.
EFFECTS OF COMPOST MANURE ON TEA YIELDS, BLACK TEA QUALITY AND SOIL HEALTH

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ABSTRACT

Tea is a perennial cash crop providing income to farmers and employment to rural populations in many parts of the world. In 2015, the Kenyan tea industry generated KShs 125 billion in foreign exchange. Sustainable tea production requires high levels of soil nutrients, particularly N, P, K, Ca and Mg, growers therefore apply compound NPK fertilizer to optimize production. Long term use of inorganic fertilizer in tea fields however, may result in moribundcy of tea. Organic manure application in tea production has been reported to be beneficial to the soil over the use of inorganic fertilizers. Owing to limited availability and consistency of the organic manure, it is rarely used. A locally available compost produced from mushroom waste, that is both consistent in composition and readily available in commercial quantities was evaluated for its effects on tea yields, quality and soil health. The trial comprised two fertilizer types (NPK, 26:5:5) and Phymix (compost manure) at five rates (0, 75, 150, 225 and 300 kg N/ha/year). It was found out that the Phymix compost had similar effects as the inorganic fertilizers in terms of yield performance. Additionally, the compost had no adverse effect on black tea quality nor soil microorganism populations, it is therefore recommended for use in organic tea production or as a supplement to inorganic fertilizers in rotational basis for maintenance of soil health.
ABSTRACT
Tea cultivation and production in Kenya has expanded in the last 50 years and the country now commands about 10% of world tea production and over 20% export share. Application of appropriate research technologies developed by the Tea Research Institute in collaboration with the industry has contributed significantly to this growth. This paper reviews past key research interventions by the institute and the future perspective of the industry with a view to maintaining a stable industry. Over the years, the industry has experienced a number of challenges that include; climate change, high cost of production, low levels of value addition and product diversification among other issues affecting the tea value chain. Overcoming these challenges has enabled build a sustainable industry.
EFFECT OF CLIMATE VARIABILITY ON TEA YIELDS IN KENYA

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ABSTRACT

Climate change is the greatest environmental challenge facing the world today. Available evidence show that climate is changing. Agricultural production is of central importance to the society, and climate change is a major concern in agricultural systems and food security. Tea is Kenya's leading foreign exchange earner, employing over 6 million people. Climate change affects tea growth and consequently management. Adverse climatic factors affecting agro-ecosystems may not only act upon tea yield but also on quality, with the potential of reducing farm income. A study was carried out at Timbilil Tea Estate, Kericho, Kenya, on long-term climate variability and its potential effect on yields. The parameters studied included; air temperature, solar radiation, rainfall and soil water deficits. It was observed that changes in annual rainfall patterns, soil water deficits and maximum air temperature are the main factors influencing variability of tea production. It also showed that temperatures have been increasing annually by a margin of +0.02°C. Decreasing rainfall reduces the tea yields depending on the distribution. Additionally, soil water deficits showed a negative correlation with tea yields. Enhancing technology, scientific knowledge and research could reduce the possible impacts of climate change on tea yields in Kenya.
ADOPTION OF PURPLE TEA IN KENYA: STATUS, OPPORTUNITIES AND CHALLENGES

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ABSTRACT

Tea in Kenya is mostly produced by smallholder farmers who sell it through the Kenya Tea Development Agency (KTDA). Tea growing is a rural based economy that contributes significantly to poverty alleviation in rural areas. Nationally, tea contributes to about 4% of the GDP. In 2011, the government approved commercial production of purple tea variety due to its high economic and medicinal values. Unfortunately, farmers are yet to embrace its production fully. This study sought to investigate the status of purple tea in Mt. Kenya region, adoption potential and challenges facing the adoption. Data was collected from farmers in the region. Simple random sampling was used to select 356 tea farmers and 13 Factory Unit Managers. Interview schedules were used for data collection. In 2011, only 1.4% of the farmers grew purple tea in the region and by 2014, the number had risen to 26.1%, representing an annual increase of about 6%. The main motivation towards the adoption was the economic value of the variety. The largest purple tea plantation by a single farmer covered 16 acres with majority of the farmers owning less than 200 bushes. Although adoption of purple tea had great potential, the rate of adoption remained relatively low in the region. This was attributed to inadequate knowledge about the variety. Only about 26.1% had knowledge about the variety, out of which only 5.8% possessed adequate knowledge. Hesitant commitment to promote purple tea by processors posed another challenge alongside small size of land, market uncertainty, lack of processing plant for the variety and socio-cultural factors. With adequate training, established markets, and support from the processors, farmers indicated willingness to grow purple tea. Thus, the study recommended training on purple tea husbandry, manufacture, marketing and value addition.
TACKLING DROUGHT THROUGH TRANSCRIPTOMIC APPROACHES IN TEA, CAMELLIA SINENSIS (L.) O KUNTZE

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ABSTRACT
Tea plants are often exposed to a plethora of drought stress that prevent them from reaching the full genetic potential. Like other plants, tea respond to drought through complex processes that involve adaptive changes or deleterious effects. This responses are controlled at the molecular level. To better understand the mechanisms involved in molecular responses to drought, responsive genes should be characterized. A study aimed at isolating putative drought responsive genes in tea plants was conducted under a ‘rain-out shelter’ using 18-months old drought tolerant (TRFCA SFS150) and drought susceptible (AHP S15/10) tea cultivars subjected to water stress. Leaf sampled from the water stressed plants were harvested for isolation of nucleic acid and subjected to high-throughput pyrosequencing on the Roche 454 platform. Genes namely heat shock proteins (CsHSP70), superoxide dismutase (CsSOD), catalase (CsCAT), peroxidase (CsPoX), calmoduline-like protein (CsCam7) and galactinol synthase (CsGols4) of the drought tolerant cultivars were differently regulated. CsHSP70 and CsSOD were over-expressed in the drought tolerant cultivar as compared to the susceptible cultivar under drought conditions. The study elucidates transcriptome analysis as an alternative strategy to tea improvement targeting climate change adaptive cultivars.
DEVELOPMENT OF EST-SSR PRIMERS FOR MARKER-ASSISTED SELECTION FOR DROUGHT TOLERANCE IN TEA (Camellia sinensis (L.) O. KUNTZE)

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ABSTRACT

Tea (Camellia sinensis (L.) O. Kuntze) is an important rain-fed industrial crop with health and economic benefit to tea growing countries. However, drought is the main abiotic stress that reduces productivity in most tea-producing areas affecting livelihoods of particularly smallholder subsector. The tea cultivars in growers’ fields were developed using conventional breeding and selection methods which take long and are expensive. Thus, development of molecular markers is essential for accelerating breeding and clonal selection which could assist in availing new cultivars that are drought tolerant, high yielding with good quality tea products. A study was carried out to identify, optimize, characterize and select drought tolerant cultivars based on EST-SSR markers designed from drought responsive EST sequences. Drought responsive C. sinensis EST sequences (7084) were retrieved and used to design a total of 86 EST-SSR primer pairs, of which, 69 primer pairs yielded clear and scorable PCR products with parental cultivars, drought tolerant female TRFCA SFS150 and 4 primer pairs cosegregated with the susceptible male parent, AHP S15/10. Two EST-SSRs primers generated specific loci namely CS106-500bp and CS56-500bp that associated with drought tolerance trait, based on drought tolerant parent, TRFCA SFS150 and 4 primer pairs co-segregated with the susceptible male parent, AHP S15/10. Two EST-SSRs primers generated specific loci namely CS106-500bp and CS56-500bp that associated with drought tolerance trait, based on drought tolerant parent, TRFCA SFS150, for drought tolerant progeny TRFK 463/04 and TRFK 463/106, respectively. The two cultivars yielded 535 Kg gl/ha/yr and 554 Kg gl/ha/yr. This implies that these bands could be used as candidate markers for selecting drought tolerant cultivars in a marker-assisted selection scheme aimed at fast-tracking climate compatible/adaptive cultivars. However, polymorphic bands, CS84-450bp) and CS80-400bp, were also found in the AHP S15/10 and some progeny, TRFK 463/52 and TRFK 463/12 with yields of 237 Kg gl/ha/yr and 292 Kg gl/ha/yr, respectively, all of which succumbed to the severe drought stress. The study demonstrated that SSR-based marker-assisted selection can be used in hastening development of a wider range of drought tolerant cultivars that meet the needs of farmers in the drought-prone regions.
AMEOLIORATION OF 4TI BREAST CANCER CELLS BY TEA

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ABSTRACT

Tea (Camellia sinensis) is a widely consumed beverage with numerous health benefits including potential anticancer activity. However, the physiological and molecular responses mediating these activities are poorly understood. Three replicates of 4TI cancer cell suspension (2.0 x 10⁵ cells/ml) were challenged in vitro with various concentrations of green, black and purple tea infusions to assess their cytotoxicity and associated differentially expressed genes in the cells. Inhibitory activity was tested by using serial dilutions of respective tea infusions in a 96 well ELISA plate. Results obtained revealed that green tea had the highest inhibition on 4TI cells proliferation at a concentration of IC₅₀ =13.12 µg/ml. Further analysis of the 4TI cancer cell line treated with green, black and purple teas using 454 pyrosequencing generated 425,696 reads with an input mean length of 286.54. Trimmed sequences were imported on a CLC genomic workbench v7.03 and annotated on a reference mouse genome (Mus musculus strain C57BL/6J). Results revealed a differential expression of apoptosis related genes in the transcriptome. Casp8, Casp9, Casp3, Casp6, Casp8AP2, Aifm1, Aifm2 and Apopt1 genes were significantly up-regulated indicating the process of apoptosis was initiated and executed. These findings on caspases offer valuable information on the mechanism of tea as an anticancer agent. This demonstration of 4TI cancer cell growth inhibition induced by tea flavonoids will contribute to further research in future novel treatments.
ABSTRACT

Tea is one of the leading cash crops in Kenya and makes significant contribution to the economy. Annually about 400 metric tons of black tea are produced. Over 95% of the made tea is exported mainly in bulk, earning over USD 900 million in foreign exchange representing about 26% of the total export earnings, and about 4% of Kenya’s GDP. Kenya produces mainly oxidized black Cut, Tear and Curl (CTC) tea in spite of the potential for specialty and other extracts which can attract higher prices in the global tea market. The study entailed use of green tea extracts in green synthesis of iron oxide nanoparticles due to its high concentration of polyphenols. Optimization experiments were carried out to determine the concentration and pH that yielded highest iron oxide nanoparticles. Synthesized nanoparticles were characterized using X-ray powder diffraction (XRD). The resulting quantum dots had crystallite sizes of 3.96-6.80nm. Use of tea extracts as a reagent will encourage adoption of tea products in industrial applications, making tea both an important beverage and an industrial reagent.