

**AN UPDATED OVERVIEW ON *CYNODON DACTYLON* (L.) PERS.**Paul Rita<sup>2</sup>, Mandal Aninda<sup>1</sup> and Datta K Animesh<sup>1\*</sup><sup>1</sup>Department of Botany, Cytogenetics and Plant Breeding Section, University of Kalyani, Kalyani 741235, West Bengal, India<sup>2</sup>Department of Botany, Charuchandra College, Kolkata- 29, India

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**ABSTRACT**

*Cynodon dactylon* (L.) Pers. (Family- Poaceae), a perennial weedy grass is one of the ten auspicious herbs that constitute the group 'Dasapushpam' in Ayurveda. The species possesses immense therapeutic as well as other potential uses. As the species grow widely as weed, it is a natural resource which can be explored. An overview is conducted on *C. dactylon* with an objective to provide information on the essential aspects for further exploration in human benefits.

**KEY WORDS:** *Cynodon dactylon*, Poaceae, *Capriola dactylon*, *Panicum dactylon***INTRODUCTION**

Many weeds of our surroundings are often very powerful medicinal plants to address many of our today's major health problems. *Cynodon dactylon* (L.) Pers. (Family- Poaceae, Sub-family- Chloridoideae, Tribe- Cynodonteae), a weedy grass (the generic name is derived from Greek word 'kuon' means dog and 'odous' means tooth, while the specific name from 'daktulos' means finger- refers to digitate inflorescence<sup>1</sup>) is one of the ten auspicious herbs that constitute the group 'Dasapushpam' in Ayurveda<sup>2</sup> (the science of life, prevention and longevity – the oldest and most holistic medical system). It is reported to be the most sacred plant of India next to *Ocimum*<sup>3</sup>. It possesses many therapeutic as well as decorative values and other unexplored potentials. Apart from its significant uses, the species is a natural resource and therefore needs to be explored. With the view to it, an overview on *C. dactylon* is presented providing adequate information which may be an impetus to researchers who can link the traditional knowledge about the species with the experimental (scientific) base enabling universal acceptance.

**Synonyms:** *Capriola dactylon* (L.) Kuntze, *Panicum dactylon* L.<sup>4</sup>**Common names around the world**

Bermuda grass (English - USA); Couch grass, Creeping panic grass, Green couch (English - Australia); Bahama grass, Devil's grass, Dogtooth grass, Hariali grass, Indian couch grass, Kiri-hiri, Quick grass, Reed grass, Scotch grass, Serangoon, Wire-grass (English); Yablith (Israel); Kweekgras (Afrikaans); Chiendent dactyle, Chiendent pied-de-poule, Grand chiendent (French); Hundezahngras (German); Capim-bermuda (Portuguese); Came de niño, Chepica brave, Grama rastrera, Gramón, Grama-seda, Zacate de bermuda (Spanish); Hierba-fina, Yerba fina (Spanish - Cuba), Chepica brave, Came de niño, Pate de perdiz, Gramilla blanca (Spanish - Peru); Griming, Tigriston (Suriname); Aruhu, Calcutta grass, Dhub grass, Dhub, Doob, Durva, (Southern Asia); Jukut kakawatan, Gigirinling, Rumpot bermuda, Rumpot grinting, Sukit grinting (Indonesia); Rumpot minyak (Malaysia); Kawad-kawad, Kapot-kapot, Bakbaka

(Philippines); Mye-sa-myet (Myanmar); Smao anchien (Cambodia); Hnha:z ph'è:d (Laos); Ya-phraek (Thailand); Cò'chi', Co'ông (Vietnam); Manienie (Hawai'i); Kabuta (Fiji); Motie molulu (Niue);<sup>5</sup> Dubo (Nepal)<sup>4</sup>.

**Local names in Indian language**

Sanskrit: Bhargavi, Doorwa, Granthi, Sveta; Hindi: Doorva, Doob; Tamil: Arugu, Aruvam-pillu, Mooyar-pul, Arugampull; Bengali: Durba; Kannada: Ambate-hullu, Garikae; Malayalam: Karuka-pulli; Marathi: Doorva, Haryali; Punjabi: Dub, Kabbar, Talla; Telugu: Garika, Gerike, Haryali; Pushtu: Kabal; Urdu: Ghass<sup>4</sup>.

**Distribution and Habitat**

*C. dactylon* is a grass native to Africa, widely spread in warm climates all over the world between 45°S and 45°N latitude<sup>6</sup> and above sea level to 2300 m altitude<sup>7</sup>; found to grow in open areas where there are frequent disturbances of grazing animals, flood, fire amongst other calamities<sup>6</sup>. The species is crowding out most other grasses and invading other habitats and has become hard to eradicate<sup>4</sup>. Due to its weedy nature it is called as 'devil's grass'<sup>4</sup>.

**Variety and Cultivars**

Notable varieties recognized in *C. dactylon* are *C. dactylon* var. *dactylon* (forage grass, Bermuda grass and turf grass – cosmopolitan weed), *C. dactylon* var. *aridus* (giant Bermuda grass – distributed from Southern India to Israel and Sinai, introduced in Hawaii and Arizona), *C. dactylon* var. *afghanicus* (found in Afghanistan), *C. dactylon* var. *coursii* (in Madagascar), *C. dactylon* var. *elegans* (in Africa south of 12°S latitude) and *C. dactylon* var. *polevansii* (in South Africa)<sup>7</sup>.

Some of the cultivars of *C. dactylon* are – 'Coastal', 'Coastercross-1', 'Tifton 78', 'Tifton 68', 'Hardie', 'Oklan', 'Brazos', 'NK37', 'Sunturf', 'Tifway', 'Tifway II', 'Tifgreen', 'Tifgreen 328', 'Tifdwarf', 'Floradwarf', 'GN-1', 'MS-Choice', 'MS-Express', 'MS-Pride', 'NuMex Sahara', 'Sultan', 'Yuma', 'Blue-muda' etc<sup>8</sup>.

**Plant Description**

*C. dactylon* is a prostrate, creeping, stoloniferous, perennial herb with rhizomes – rooting at every nodes, culms 8-40; root system deep; stem creeping, 1-30 cm long, slightly flattened, terete, glabrous, often tinged

purple in color; leaf blades grey-green, 2-15 cm long, 4 mm broad, flat to slightly keeled, edges rough, tip sharp; leaf sheath round, glabrous; ligule with ring of hairs or membrane; inflorescence spike, 2-5 cm long, 3 to 6 in a whorl; flowers spikelets with one perfect floret; glumes 2 mm long, lanceolate, acute at the apex, lower glume smaller than the upper; lemmas 2-8 mm long, 3-nerved, acute, pubescent or scabrous on the nerves; anthers 1.3 mm long, yellow; styles purple; seeds ovoid, about 1.5 mm long, yellow to reddish.

Distinguishing characteristics of *C. dactylon* are the conspicuous ring of white hairs of the ligule, the fringe of hairs on the keel of the lemma and gray-green appearance of the foliage<sup>1,4,6,8,9</sup>.

#### Used Parts

Stem and leaf.

#### Chemical Constituents

The plant contains crude proteins, carbohydrates and mineral constituents, oxides of magnesium, phosphorous, calcium, sodium and potassium. The whole plant affords sitosterol and carotene. Other compounds like vitamin C, cartone, palmitic acid, triterpenoides, alkaloids ergonovine and ergonovinine etc.<sup>3</sup> are also present.

#### Ecology

The species tolerates a wide range of soil type and conditions, but growth is greater on heavy clay soil than on light sandy soils of dry regions; tolerates low fertility soil as well<sup>10</sup>. It can survive long periods of flooding, but little to no growth occurs without adequate soil aeration<sup>10</sup>. It grows on soils with a wide range (5.0-8.0) of pH values<sup>8</sup>; however, alkaline soils are tolerated more than acidic ones<sup>10</sup>. Optimal temperature for growth is 24°C<sup>8</sup>. It is drought tolerant but shade intolerant<sup>8</sup>.

#### Diseases and Pests of Bermuda Grass

Rust (*Puccinia graminis*) and *Helminthosporium* leafspot along with tar spot caused by *Phyllachora* are the reported fungal diseases of *C. dactylon*. Other fungal pathogens causing diseases in the species are *Bipolaris*, *Gaeumannomyces*, *Leptosphaeria* and *Marasmius*. Smuts from *Sporisorium*, *Sorosporium* and *Ustilago* can also infect seedheads. The plant is also attacked by the bacterium *Xanthomonas cynodontis* and by barley yellow dwarf virus and lucerne dwarf virus. Viral stripe diseases as well as diseases caused by nematodes (major: root knot nematode - *Meloidogyne* spp.) are commonly found in the species. Major pests reported from the plant were armyworm (*Spodoptera frugiperda*), tropical grass webworm (*Herpetogramma licarsialis*), spittlebug (*Prosapia bicinata*) and Bermuda grass mite (*Eriophes cynodontensis*). The parasitic flowering plants like *Cuscuta pentagona* (Convolvulaceae), *Nuytsia floribunda* (Loranthaceae), *Striga harmonithica*, *Striga lutea* (Orobanchaceae) can also adversely affect the grass<sup>5</sup>.

#### Chromosome Number

Variation in chromosome number was studied in the species. Chromosome number 2n=36 with ancestral basic chromosome number x=9 was reported<sup>11-14</sup>; although, Forbes and Burton<sup>15</sup> and Clayton and Harlan<sup>16</sup> were of opinion that the species possesses 2n=18 chromosomes with x=9. However, Hurcombe<sup>17</sup> and Rochecouste<sup>18</sup> recorded 2n=40 chromosomes with x=10 as basic number. deSilva and Snaydon<sup>19</sup> suggested that variation

in chromosome number in the species may possible due to ecological niche.

Chromosome number variation among the varieties was also recorded<sup>5,7</sup>: a) *C. dactylon* var. *dactylon*: 2n=4x=36, b) *C. dactylon* var. *aridus*: 2n=2x=18, c) *C. dactylon* var. *afghanicus*: 2n=2x=18 and 2n=4x=36, d) *C. dactylon* var. *coursii*: 2n=4x=36, e) *C. dactylon* var. *elegans*: 2n=4x=36 and f) *C. dactylon* var. *polevansii*: 2n=4x=36.

#### Pollination

*C. dactylon* is wind-pollinated, and generally self-incompatible, suffering from inbreeding depression<sup>5</sup>.

#### Therapeutic Uses

The species possesses immense medicinal value and may be applied both externally as well as internally. Being haemostatic, refrigerant, healer and beneficial for skin complexion, externally it is used in wounds, hemorrhages, burning sensation (like urticaria, erysipelas) and discoloration of skin<sup>3</sup>. Leaf paste is applied in traumatic wounds and piles, fresh juice of the plant is installed into eyes for catarrhal conditions and when used as nasal drops controls nasal bleeding<sup>3</sup>. Paste of the plant is applied on forehead in headache<sup>3</sup>. Internally the plant is used in various diseases like epilepsy<sup>3</sup>, hysteria<sup>3</sup>, bleeding in dysentery<sup>3</sup>, piles<sup>3</sup>, haematuria<sup>3</sup>, epistaxis<sup>3</sup>, menorrhagia<sup>3</sup>, diarrhea<sup>3</sup>, raktapitta<sup>3</sup>, prostatitis<sup>4</sup>, syphilis<sup>4</sup>, urinary tract infection<sup>4</sup> amongst other diseases. The plant extract checks uterine bleeding, strengthens the uterus, averts abortion and augments of foetal growth<sup>3</sup>. The species is also used in traditional cultures for toothache and ambiosis<sup>4</sup>. Decoction of *C. dactylon* can be used to treat kidney stones<sup>20, 21</sup>. Extract of the whole plants shows antiviral activity against vaccinia virus<sup>3</sup>, white spot syndrome virus<sup>22</sup>.

Recent studies indicated the diuretic<sup>10,23</sup>, anti-arthritis<sup>2</sup>, anti-cancerous<sup>24</sup>, antioxidant<sup>25,26</sup>, antiulcer<sup>27</sup>, anticonvulsant<sup>28</sup>, DNA protective<sup>29,30</sup>, immunomodulatory<sup>30</sup> properties of the species. Hyperglycemic and hyperlipidemic properties (plant extract)<sup>25,31-35</sup>, nitric oxide scavenging activity<sup>36</sup>, protectivity against ischemia (studied in rat heart)<sup>37</sup>, CNS depressive activity in rat (ethanol extract of aerial part)<sup>38</sup>, improvement in cardiac functions in rat (hydroalcoholic extraction of rhizome)<sup>39</sup>, preventive against aluminium induced neurotoxicity<sup>40</sup> and carbofuran induced oxidative stress<sup>41</sup> (aqueous extract), aphrodisiac and male fertility activity<sup>42</sup> were also reported in the species.

#### Biosafety

Most of the varieties of *C. dactylon* are non-toxic but an occasional case of HCN poisoning may occur. The species was found to possess 1.10% total oxalic acid in the dry matter without showing any toxicity<sup>7</sup>.

#### Other Potential Uses

Arjunan *et al.*<sup>43</sup> showed the mosquitocidal (against *Anopheles stephensi*, *Culex quinquefasciatus* and *Aedes aegypti*) and water purification properties of *C. dactylon*. Bagavan and Rahuman<sup>44</sup> reported larvicidal activity of the species against *Armigeres subalbatus*. The grass is reported to be highly nutritional for cattle<sup>6</sup>. It can also be used as dietary supplement for carp<sup>45, 46</sup>. Cantrell *et al.*<sup>47</sup> suggested coastal Bermuda grass (receiving subsurface drip irrigation with advanced treated swine waste water) as an important source of bioenergy. According to an old Venda tradition, the grass is used in the fermentation

process to make bear sour<sup>1</sup>. Besides these, the plant is cultivated as lawn grass for decorative purpose<sup>3</sup>, and also used for erosion control<sup>1</sup>.

### Phytoremediation

*C. dactylon* was found to possess phytoremediation potential against dibenzofuran contaminated soil<sup>48</sup>, fly ash<sup>49</sup>, aged petroleum sludge<sup>50</sup> etc. Bermuda grass can accumulate very high concentration of Pb (0.15-0.65%)<sup>51</sup> and Zn (0.22-1.56%)<sup>51</sup> in the roots<sup>52,53</sup>; waste elements (like Ca, Cr, Cu, Pb, Zn, Mn and Fe) in wetland plants<sup>54</sup>; certain concentration of Cu<sup>53,55,56</sup>; arsenic<sup>56,57</sup> amongst others and thus can serve as potential candidate for revegetation in many heavy metal contaminated wastelands. Wang *et al.*<sup>58</sup> showed that the species can transform Cu forms in rhizosphere soil. The grass tolerates many trace elements and seems to be suitable for stabilization of spill-affected soil<sup>59</sup>.

A mutualistic interaction between *C. dactylon* and certain microorganisms can result in phytobioconversion of hard coal in the rhizosphere<sup>60</sup>. Mukasa-Mugerwa *et al.*<sup>61</sup> suggested that interaction between *C. dactylon*, arbuscular mycorrhizal fungi, *Neosartorya fischeri* and other coal degrading rhizosphere fungi could lead to the degradation of hard coal *in situ* and application of these organisms could be a novel method for coal dump rehabilitation.

### CONCLUSION

As the species is a weedy grass and cultivation is not an essentiality, therefore the species may easily be explored for human benefits from natural habitat. The present endeavor provides information which may generate interest among researchers to explore such natural resources.

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