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Some fodder yielding trees of Meghalaya, Northeast India

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Holstian Friesian and Jersey cross breeds of cattle are being reared for milk and manure by stall-feeding practices in several places and altitudes of Meghalaya. Both the types of breeds can yield more milk for longer duration during each lactation period, on account of which the dairy development scheme at private level has been much flourished in Meghalaya. Cattle breeders usually supplement the paddy straw and dry grasses during lean period (October-May) by green fodder lopped from 126 tree species belonging to 77 genera under 46 families. These fodder trees have their respective palatability and lopping cycle.

Keywords: Fodder trees, Cattle, Meghalaya

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Meghalaya situated between 25°47'-26°10' N latitude and 89°45'-92°47' E longitude covers an area of 22,429 sq km. The state is a conglomeration of undulating hills with an East west orientation. It represents a picturesque landscape of plateaus, lakes, waterfalls and valleys. The conducive climate together with the geographical position which includes a large number of luxuriantly growing fodder trees and grasses. As a result, the livestock breeders are rearing Holstian Friesian and Jersey cross breeds of cattle for milk and manure by stall-feeding practices in rural and urban areas of Khasi, Jaintia and Garo hills of Meghalaya, most of them in East Khasi Hills (Figs. 1 & 2). Buffaloes, local breeds of cattle, sheep and goats are also reared in some rural areas but maintained by grazing and browsing system. During rainy season (June-September) the stall feeding crossbred cattle are fed mostly with green grasses as they are rich in nutrients along with the usual concentrates. But during lean period (October-May), the cereal straw and dry grasses perhaps being very poor in protein content are supplemented with other green fodder of high nutrient value and this is generally met by the use of fodders lopped from a large number of tree species (Figs. 3 & 4). Some plant explorers have dealt with the exploration of general flora, forest flora, fern & fern-allies, orchids, broad leaved fodder yielding herbs, kitchen garden plants, ethnodomestication of plants, biodiversity conservation and some wild edible plants in Meghalaya[1-10]. There has been no separate study on the documentation of fodder yielding trees of the state. As such, the study was undertaken to bring out a preliminary account on fodder trees of Meghalaya.

Methodology

Fortnightly visits were made to different cattle farmyards of Meghalaya for collecting information about tree fodders used by the breeders to their cattle. Seasonal tours were made at bimonthly intervals to various localities of the state for collecting the tree fodder specimens. The herbarium specimens were made, identified and confirmed by BSI, EC, Shillong[11,12]. The palatability and lopping cycle were noted by interviewing the breeders. Palatability is the state of different fodders of being agreeable to eat by the cattle. It has been categorized as high, moderate and low, depending on the amount of fodder voluntarily eaten by the cattle. Lopping cycle is the period of collecting fodder, during which the fodder is available. Herbarium specimens were deposited in St. Anthony's College, Shillong. In the enumeration, plant species and families are arranged followed by palatability and lopping cycle[13].

Results and discussion

In total, 126 species of fodder trees under 46 genera belonging to 77 families have been identified and


Fig. 1 Cross bred jersey cow


Fig. 2 Holstian Friesian cow


Fig.3 Collection of Fodder


Fig. 4 Carrying of fodder


Fig. 5 *Alnu nepalensis*


Fig. 6 *Euria acuminata*


Fig. 7 *Celtis tetranda*


Fig. 8 *Exbucklandia populnea*


Fig. 9 *Glochidion acuminate*


Fig.10 *Ilex khasiana*


Fig.11 *Ligustrum robustum*


Fig.12 *Maesa indica*


Fig.13 *Photinia notoniana*


Fig.14 *Symplocus paniculata*


Fig.15 *Wenlandia grandis*


Fig.16 Paddy straw for winter

documented (Figs. 5-15). Moraceae has appeared to be the dominant family with 15 species of fodder trees, followed by Lauraceae with 14 species and Fagaceae with 8 species (Table 1). The identification of more fodder trees is important since, trees have two characteristics which make them particularly useful during drought. Firstly, they are able to draw on moisture and minerals deep in the soil which are out of reach for grasses, secondly, the leaves of most trees retain their nutritive value even when they are mature[14]. Trees and shrubs provide fodder which is of great importance during period of nutritional stress in the dry season when the nutritional value of dormant grasses and forbs is low[15]. Paddy straw and dry grasses being less milk productive, cattle breeders usually supplement them with productive, nutritious green broad leaved tree fodders, suitable particularly for milk cattle (Fig. 16). Tree fodders are generally collected from nearby forests. Fodder from 83 tree species are found to be highly palatable, whereas from 37 species are moderately palatable and from 4 species the fodder is having low palatability. So far the lopping cycle is concerned; it varies from species to species. Fifty fodder species have the lopping cycle

Table 1—Enumeration of fodder trees

Plant species	Family	Palatability	Lopping cycle
Dillenia indica Linn.	Dilleniaceae	High	Oct - May
D. pentagyna Roxb.	Dilleniaceae	Moderate	April - May
Manglietia insignis (Wall.) Bl.	Magnoliaceae	High	Oct - May
Camellia kissi Wall.	Theaceae	Moderate	Jan - May
Eurya acuminata DC.	Theaceae	High	Oct - May
Schima khasiana Dyer	Theaceae	Moderate	April - May
S. wallichii (DC.) Korth.	Theaceae	Moderate	April - May
Saurauia punduana Wall.	Saurauiaceae	High	April - May
S. roxburghii Wall.	Saurauiaceae	High	April - May
Shorea robusta Gaertn.	Dipterocarpaceae	Moderate	March- May
Kydia calycina Roxb.	Malvaceae	High	Oct - May
Heritiera macrophylla Kurz	Sterculiaceae	High	Oct - May
Grewia elastica Royle	Tiliaceae	High	March- May
G. multiflora Juss.	Tiliaceae	High	March- May
Murraya koenigii (Linn.) Spreng.	Rutaceae	Moderate	April - May
Garuga pinnata Roxb.	Burseraceae	High	April - May
Azadirachta indica A. Juss.	Meliaceae	High	Oct - May
Melia azedarach Linn.	Meliaceae	High	April - May
Ilex excelsa (Wall.) Hook. f.	Aquifoliaceae	Moderate	Oct - May
I. khasiana Purk.	Aquifoliaceae	Moderate	Feb-May
I. odorata Buch.-Ham.ex D. Don	Aquifoliaceae	Moderate	Oct - May
I. umbellutta (Wall.) Loer.	Aquifoliaceae	High	April - May
Zizyphus mauritiana Lamk.	Rhamnaceae	High	April - May
Aesculus assamica Griff.	Hippocastanaceae	Moderate	April - May
Rhus acuminata DC.	Anacardiaceae	Moderate	March- May
R. javanica Linn.	Anacardiaceae	High	April - May
Moringa oleifera Lamk.	Moringaceae	High	March- May
Butea monosperma (Lamk.) Kuntze.	Fabaceae	High	Oct – Dec
Erythrina arborescens Roxb.	Fabaceae	High	April - May
E. stricta Roxb.	Fabaceae	Moderate	April - May
Bauhinia purpurea Linn.	Caesalpiniaceae	High	Oct - May
B. variegata Linn.	Caesalpiniaceae	High	Oct – Dec.
Albizia chinensis (Osb.) Merr.	Mimosaceae	Moderate	April - May
A. lebbeck (Linn.) Benth.	Mimosaceae	High	Oct - May
Docynia indica (Wall.) Decene.	Rosaceae	High	April - May
Eriobotrya bengalensis Hook.f.	Rosaceae	High	March- May
Photinia notoniana Wt. & Arn.	Rosaceae	High	Jan - May
Prunus cerasoides D. Don	Rosaceae	Low	Feb - May
P. nepaulensis (Ser.) Steud.	Rosaceae	High	April - May
Pyrus pashia D. Don	Rosaceae	High	April - May
Itea chinensis Hook.f. & Arn.	Iteaceae	Moderate	Feb - May
I. macrophylla Wall.	Iteaceae	High	Feb - May
Corylopsis himalayana Griff.	Hamamelidaceae	High	April - May
Exbucklandia populnea (Griff.) R.W.Br.	Hamamelidaceae	High	Oct - May
Terminalia chebula Retz.	Combretaceae	High	April - May
T. myriocarpa Heurch. & Muell.	Combretaceae	High	Oct - May
Syzygium balsameum (Wt.) Wall.	Myrtaceae	Moderate	April -May
S. cumini (Linn.) Skeels	Myrtaceae	Moderate	April -May
Lagerstroemia speciosa (Linn.) Pers.	Lythraceae	Moderate	April - May
Brassaiopsis glomerulata (Bl.) Regel.	Araliaceae	High	Oct - May
Schefflera hypoleuca (Kurz) Harms	Araliaceae	High	Oct - May
Anthocephalus chinensis (Lamk.) A. Rich.ex Walp.	Rubiaceae	Moderate	April - May
Wenlandia grandis Cown	Rubiaceae	Moderate	April – May
W. wallichii W. & A.	Rubiaceae	Moderate	Jan - May
Maesa indica (Roxb.) Wall.	Myrsinaceae	High	Oct - May
Symplocus glomerulata King ex Cl.	Symplocaceae	High	Oct - May

Contd.

Table 1—Enumeration of fodder trees—*Contd.*

Plant species	Family	Palatability	Lopping cycle
S. paniculata (Thumb.) Miq.	Symplocaceae	High	March- April
S. theaefolia Buch.- Ham.ex. D. Don	Symplocaceae	High	Jan – May
Styrax serrulatum Roxb.	Styracaceae	High	Oct – May
Fraxinus floribunda Wall.	Oleaceae	High	March- May
Ligustrum robustum (Roxb.) Bl.	Oleaceae	High	Oct. – May
Holorrhena antidysenterica (Linn.) Wall.	Apocynaceae	Low	April – May
Buddleja asiatica Lour.	Loganiaceae	Moderate	Oct – May
B. macrostachya Benth.	Loganiaceae	Moderate	April – May
Stereospernum chelonoides (Linn.f.)DC.	Bignoniaceae	High	April – May
Callicarpa arborea Roxb.	Verbenaceae	Moderate	Jan – May
C. psilocalyx Cl.	Verbenaceae	Moderate	Oct – May
Gmelina arborea Roxb.	Verbenaceae	High	March- May
Vitex penducularis Wall. Ex Sch.	Verbenaceae	Moderate	April – May
V. quinata (Lour.) F.N. William	Verbenaceae	High	Oct – May
Leucosceptrum canum Sm.	Lamiaceae	High	March- May
Cinnamomum bejolghota (Buch.-Ham.) Sweet.	Lauraceae	High	Oct – May
C. glanduliferum (Nees) Meissn.	Lauraceae	High	March- May
C. pauciflorum Nees.	Lauraceae	High	Oct – May
C. tamala Fr. Nees.	Lauraceae	High	Oct – May
Lindera pulcherrima (Nees.) Benth.	Lauraceae	High	Oct – May
Litsea cubeba (Lour.) Pers.	Lauraceae	High	Oct – May
L. khasyana Meissn.	Lauraceae	High	March- April
L. monopetala (Roxb.) Pers.	Lauraceae	High	Oct – May
Neolitsea cassia (L.) Kosterm.	Lauraceae	High	Oct – May
Persea bombycina (King ex. Hook.f.) Kosterm.	Lauraceae	High	Oct – May
P. gamblei (King ex. Hook.f.) Kosterm.	Lauraceae	High	Oct – May
P. kingii (Hook.f.) Kosterm.	Lauraceae	High	Oct – May
P. odoratissima (Nees.) Kosterm.	Lauraceae	High	Oct – May
Phoebe cuminate (Nees.) Nees.	Lauraceae	High	Oct – May
Helicia nilagirica Bedd.	Proteaceae	High	March- May
H. robusta Wall. Ex Benth.	Proteaceae	Moderate	April – May
Antidesma acidum Retz.	Euphorbiaceae	High	Oct-May
Bridelia pubescens Kutz	Euphorbiaceae	High	Jan-May
Emblica officinalis Gaertn.	Euphorbiaceae	Moderate	April – May
Glochidion cuminate Muell.-Arg.	Euphorbiaceae	High	Jan – May
G. assamicum Hook.f.	Euphorbiaceae	High	Oct – May
G. sphaerogynum Kurz	Euphorbiaceae	High	March- May
Mallotus phillipensis (Lam.) Muell.-Arg.	Euphorbiaceae	Moderate	Dec – May
Celtis tetranda Roxb.	Ulmaceae	High	March- May
Trema cannabina Lour.	Ulmaceae	High	March- May
T. orientalis (Linn.) Bl.	Ulmaceae	High	Oct – May
Artocarpus chaplasa Roxb.	Moraceae	High	Oct – May
A. gomezianus Wall. Ex Trecul	Moraceae	High	Oct – May
A. heterophyllus Lamk.	Moraceae	High	Oct – May
Ficus auriculata Lour.	Moraceae	High	Oct – May
F. benghalensis Linn.	Moraceae	High	Oct – May
F. bhotanica King ex Hook.f.	Moraceae	High	Oct – May
F. fulva Reinwardt	Moraceae	High	Oct – May
F. hispida Linn.f.	Moraceae	High	March- May
F. lamponga Miq.	Moraceae	High	Feb – May
F. oligodon Miq.	Moraceae	High	Feb – May
F. religiosa Linn.	Moraceae	High	April – May
F. semicordata J.S. Sm.	Moraceae	High	Oct – May
F. virens Ait.	Moraceae	High	Oct – May
Morus australis Poir.	Moraceae	High	March- May
M. serrata Roxb.	Moraceae	High	March- May

Contd.

Table 1—Enumeration of fodder trees—*Contd.*

Plant species	Family	Palatability	Lopping cycle
Debregeasia longifolia (Burm. f.) Weed.	Urticaceae	High	March- May
Moutia puya Weed.	Urticaceae	High	Oct - May
Engelhardtia spicata Leschen. ex Bl.	Juglandiaceae	Moderate	Oct - May
Myrica esculenta Buch.-Ham. ex D.Don	Myricaceae	Low	April - May
Alnus nepalensis D. Don	Betulaceae	Moderate	April - May
Betula alnoides Buch.-Ham. ex D. Don	Betulaceae	High	Dec - May
Castronopsis indica A. DC.	Fagaceae	Moderate	Feb - May
C. kurzii (Hance) S.M.Biswas	Fagaceae	High	Feb -May
C. tribuloides (Sm.) DC.	Fagaceae	High	Oct - May
Lithocarpus dealbatus (Hook. f. et Thoms. ex Miq.) Rehder	Fagaceae	Moderate	April - May
L. elegans (Blume) Hatus ex Soepadmo	Fagaceae	Moderate	Feb - May
Quercus glauca Thunb.	Fagaceae	High	Jan - May
Q. griffithii Hook.f. & Thoms. ex DC.	Fagaceae	High	April - May
Q. serrata Thunb.	Fagaceae	Moderate	April - May

throughout the lean period (October-May), 36 species from April to May, 18 species from March to May, 9 species from January to May, 8 species from February to May, 2 species from December to May, 2 species from October to December and lastly 1 species from March to April. Majority of the species have longer lopping cycle and higher palatability, which are taken as positive attributes of the fodder trees by the breeders. The main impact of feeding such fodder during lean period as supplementary item has been observed to have maintained the sustainable production of cattle milk in Meghalaya.

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