



Identification key and check list of taxa of family Asteraceae of Jharkhand, India

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ABSTRACT

A checklist of flora of Asteraceae of Jharkhand state was prepared with the help of relevant literature and voucher specimens found in Central National Herbarium, Howrah, Herbarium of Ranchi University, Ranchi and National Botanical Research Institute, Lucknow. All the genera, species and varieties were enumerated with identification keys. The generic distributions at the global, national and state level and species on district-wise have been provided. The valid names of the species along with author citation(s), flowering and fruiting time and occurrence at district level were provided. Our study revealed that the family Asteraceae in Jharkhand is represented by 123 species and 05 varieties under 62 genera. The purpose of compilation of the checklist is to document the diversity and distribution of the members of family Asteraceae in Jharkhand state and the taxonomic key is to help students and botanist for ease of identification.

Key words: Asteraceae, checklist, flora, Jharkhand

INTRODUCTION

Jharkhand is literally known as land of bushes compassing an area of 79,710 sq. km with geo-coordinates 21° 95' to 25° 45' N, 83° 35' to 87° 95' E (<https://himset.com/states/statewise-latitude-longitude.php>). The state is bounded in north to Bihar, north-west to Uttar Pradesh, west to Chhattisgarh, south to Odisha as well as east to West Bengal. About 29.61% of the geographical area (23,605 sq. km) of the state is covered by natural forest and after addition with tree plantation, it increased to 32.48% which higher than the national average of 23.81% (<http://forest.jharkhand.gov.in/>). According to Champion and Seth (1968), there are three types of forests are found in the state: (a) Moist tropical forests, (b) Dry tropical forests, and (c) Montane subtropical forests.

Moist tropical forests type is dominated by Sal (*Shorea robusta*), the principal associates of *Shorea robusta* are *Pterocarpus marsupium*,

Terminalia alata, *T. arjuna*, *T. bellirica*, *Madhuca longifolia*, *Mitragyna parvifolia*, *Protium serratum*, *Haldinia cordifolia*, *Dillenia pentagyna*, *Garuga pinnata*, *Diospyros melanoxyton*, *Syzygium cumini*, *Alstonia scholaris*, *Artocarpus lakoocha*, *Schleichera oleosa*, etc. Some common shrubs are *Colebrookea oppositifolia*, *Petalidium barlerioides*, *Urena lobata*, *Uraria rufescens*, *Croton roxburghii*, *Desmodium gyroides*, etc. and prominent climbers are *Ampelocissus latifolia*, *A. tomentosa*, *Abrus precatorius*, *Naravelia zeylanica*, *Bauhinia vahlii*, *Tiliacora acuminata*, etc.

Dry tropical forests covers about 75% of the total forest area and dominated by *Boswellia*, *Acacia*, *Butea*, bamboos, etc. in different localities. The *Shorea robusta* are smaller in size with compare to moist tropical forests. Dominant trees are *Shorea robusta*, *Anogeissus latifolia*, *Buchanania lanzan*, *Terminalia alata*, *T. bellirica*, *Sterculia urens*, *Boswellia serrata*, *Mitragyna parvifolia*,

Butea monosperma, *Lannea coromandelica*, *Lagerstroemia parviflora*, *Acacia catechu*, *Soymida febrifuga*, *Ailanthus excelsa*, etc. and common shrubs are *Murraya paniculata*, *Nyctanthes arbor-tristis*, *Helicteres isora*, *Ziziphus mauritiana*, *Flemingia chappar*, *F. macrophylla*, *F. strobilifera*, *Flacourtia indica*, *Petalidium barlerioides*, *Indigofera cassioides*, *Woodfordia fruticosa*, etc. Parasitic angiosperms like, parasitic angiosperms are *Cuscuta* spp., *Dendrophthoe falcata*, *Viscum* spp., etc are commonly visible in this type of forests.

Montane subtropical forests are restricted to small patches in Parasnath hilly areas above 1,220 m. Common species are *Pittosporum wightii*, *Meyna spinosa*, *Grewia* spp., *Berberis asiatica*, *Reinwardtia indica*, *Thalictrum foliolosum* and in between 650 to 1,220 m *Litsea monopetala*, *Ficus microcarpa*, *F. mollis*, *Symplocos racemosa*, *Alangium salvifolium*, *Indigofera pulchella*, are frequently found.

There are three well defined seasons in Jharkhand viz. summer, rainy and winter. The summer season is in between March to June, it is hot and dry and temperature varies from 40 to 46°C. The rainy season is starts from middle of June to middle of October and the annual average rainfall is c. 1200 mm. The winter sets in the month of November and continues up to February (<https://www.accuweather.com/>). Ranchi, Hazaribagh, Santal Pargana and Singhbhum districts has red soil due high percentage of acid soluble Ferric oxide and lower pH ranging. However, in the higher plateaus and valleys, lateritic soil is found. In addition, in some pockets alkali and saline soils are also found. Tribal population of the state is about 26%, Santhal is the major tribe and some other major tribes are Oraon, Parhaiya, Ho, Lohra, etc.

Diversity of flora is important indicator of the health of ecosystem (Bhujel et al., 2017; Misra et al., 2018; Shukla et al., 2022). The rich diversity of flora had attracted many taxonomists in the state. Anderson (1863) was the first sporadic plant explorer in Parasnath hills to study the flora of Bihar based on the collection of Hooker, Edgeworth

and Thomson and after few years Clarke (1884) also studied on the flora of Parasnath. Haines (1910) did extensive work in Chotanagpur plateau and published a comprehensive account entitled "A Forest Flora of Chotanagpur" with 275 species recorded from Singhbhum. However, his most notable work was "Botany of Bihar and Orissa" which was appeared in six parts including 813 species from Singhbhum were reported (Haines, 1921-1925). Later, other botanists like Mooney (1941,1944,1950), Mukerjee (1947,1956), Bressers (1951), Sanyal (1957), Ara (1960,1966), Kanodia and Malick (1966), Panigrahi (1966), Meher-Homji (1971), Paul (1976,1978,1984,1990), Paul and Prasad (1978), Raizada (1978), Majumdar and Biswas (1979), Biswas and Maheshwari (1980), Mishra (1985), Paria and Chattopadhyay (2000, 2005), Singh et al. (2001), Sarma and Sarkar (2002) and Ranjan (2014) have significantly contributed to the flora of Bihar and Jharkhand states. The past publications revealed that the family Asteraceae of Jharkhand was not studied so far therefore the present work was taken up to evaluate the diversity of the family in the state.

MATERIALS AND METHODS

The present work on checklist of the family Asteraceae was initiated in June, 2016 and completed in March, 2017. The relevant literatures like, the Botany of Bihar and Orissa (1921-1925), Flora of Bihar analysis (2001), Flora of Palamau (2002), Flora of Parasnath (2014) and some additions to the Botany of Bihar and Odisha (1941) and Supplement to the Botany of Bihar and Odisha (1950) were referred. In addition, the specimens deposited in Central National Herbarium (CAL), Howrah, Herbarium of Ranchi University, Ranchi and National Botanical Research Institute (LWG), Lucknow were consulted. Worldwide distribution of species was verified through Mabberley (2008, 2017) and POWO (<https://powo.science.kew.org/>). IPNI (<https://www.ipni.org/>) and POWO (<https://powo.science.kew.org/>) was consulted for updated information. The National level and state level distribution was verified from endemic

vascular plants of India (2009) and Flora of Bihar analysis (2001), respectively. The nomenclature was updated through authentic online databases: the plant list (<http://www.theplantlist.org>) and International Plant Name Index (<http://www.ipni.org>). The Bentham and Hooker's system of classification was followed and a dichotomous key for diagnostic features for genera and species was provided for easy identification of taxa.

RESULTS AND DISCUSSION

A total of 128 taxa under 62 genera, 123 species and 5 varieties were recorded from published literatures (Singh et al., 2001), specimens deposited at CAL, herbarium of Ranchi University and National Botanical Research Institute, Lucknow. The species/varieties are arranged alphabetically along with notes on phenology and distribution at district label. The identification keys to the genera are as follows:

Key to the genera

1a	Achenes covered in burr	<i>Xanthium (LXI)</i>
1b	Achenes not covered in burr	2
2a	Capitula homogamous	3
2b	Capitula heterogamous	.22
3a	Plants produce milky juice; flowers all ligulate	4
3b	Plants produce watery juice, if present; flowers all tubular	8
4a	Achenes distinctly beaked; beak slender	5
4b	Achenes not beaked, if beaked, beak very short and stout in <i>Youngia</i>	6
5a	Radical leaves long petioled	<i>Ixeris (XXXIX)</i>
5b	Radical leaves sessile	<i>Lactuca (XL)</i>
6a	Achenes compressed	<i>Sonchus (LIII)</i>
6b	Achenes narrow, truncate at both ends	7
7a	Achenes 4-5-ribbed; inner involucre bracts scarious margined	<i>Launaea (XLIII)</i>
7b	Achenes 10-20-ribbed; inner involucre bracts not scarious margined	<i>Youngia (LXII)</i>
8a	Anthers tailed at base	9
8b	Anthers not tailed at base	13
9a	Leaves not spinous margined; achenes winged	<i>Caesulia (XIII)</i>
9b	Leaves mostly spinous margined; achenes not winged	10
10a	Heads one flowered, crowded into globose involucre	<i>Echinops (XXIV)</i>
10b	Heads many flowered, separate	11
11a	Plants armed; achenes of outer florets without pappus	<i>Carthamus (XV)</i>
11b	Plants unarmed; achenes of outer florets with pappus	12
12a	Heads solitary, terminal; basal areole oblique or lateral	<i>Tricholepis (LVI)</i>
12b	Heads in fascicles, corymbs or panicles; basal areole horizontal	<i>Saussurea (XLVIII)</i>
13a	Anthers sub-entire or cleft at base	14
13b	Anthers entire at base	19
14a	Leaves opposite	15
14b	Leaves alternate	18
15a	Plants usually twining herbs; heads 4-flowered; involucre bracts 3-5	<i>Mikania (XLIV)</i>
15b	Plants usually erect herbs; heads more than 4-flowered; involucre bracts more than	16
16a	Pappus of capillary bristles	<i>Eupatorium (XXX)</i>

16b	Pappus of scales or clavate hairs	17
17a	Pappus of scales	<i>Ageratum(IV)</i>
17b	Pappus of clavate hairs	<i>Adenostemma(III)</i>
18a	Heads distinct; florets 1-many	<i>Vernonia(LIX)</i>
18b	Heads in glomerules; florets 1-5	<i>Elephantopus(XXVI)</i>
19a	Leaves usually opposite; heads in terminal glomerules, 1-flowered; pappus a toothed or fimbriate cup	<i>Lagascea(XLI)</i>
19b	Leaves usually alternate; heads not in glomerules, many flowered; pappus a fine capillary hairs or bristles	20
20a	Involucre ecalyculate	<i>Emilia(XXVII)</i>
20b	Involucre calyculate	21
21a	Inflorescences solitary or corymbose; capitula yellow to purple; involucre bracts not connivent; receptacles flat, pitted or shortly fimbriate; achenes fusiform	<i>Gynura(XXXVII)</i>
21b	Inflorescences lax terminal racemes; capitula pink to brick red; involucre bracts connivent; receptacles convex, naked, shallowly alveolate; achenes cylindrical	<i>Crassocephalum(XXI)</i>
22a	Anthers tailed at base (except <i>Laggera</i> and <i>Blumeopsis</i>)	23
22b	Anthers not tailed at base (rarely tailed in <i>Senecio</i>)	34
23a	Leaves mostly spinous margined; involucre bracts with long spreading or recurved spinescent awns; receptacles shortly bristly; achenes punctate between angles	<i>Amberboa(V)</i>
23b	Leaves not spinous margined; involucre bracts not with long spreading or recurved spinescent awns; receptacles glabrous; achenes not punctate between angles	24
24a	Receptacles paleaceous	<i>Athroisma(VIII)</i>
24b	Receptacles epaleaceous	25
25a	Heads usually radiate (except <i>Carpesium</i>)	26
25b	Heads discoid or disciform	29
26a	Achenes beaked; pappus absent	<i>Carpesium(XIV)</i>
26b	Achenes not beaked; pappus present	27
27a	Achenes obscurely ribbed; pappus 1-seriate, few or absent in ray florets	<i>Pentanema(XLVI)</i>
27b	Achenes prominently ribbed; pappus 1-2-seriate, many in ray florets	28
28a	Heads solitary; outer row of pappus of short jagged teeth or forming a setulose-laciniate cup	<i>Pulicaria(XLVII)</i>
28b	Heads solitary, corymbose or panicled; outer row of pappus of hairs, not forming cup	<i>Inula(XXXVIII)</i>
29a	Involucre bracts all scarious; style arms of bisexual florets filiform, obtuse, capitate, truncate or 2-cleft; achenes scaly or papillose	30
29b	Outer involucre bracts herbaceous or dry and inner scarious; style arms of bisexual florets filiform; achenes variously hairy or glandular	31
30a	Bisexual florets all sterile; styles undivided or notched	<i>Anaphalis(VI)</i>
30b	Bisexual florets all or mostly fertile; styles divided	<i>Gnaphalium(XXXIV)</i>
31a	Heads compound, few flowered aggregated into globose glomerules	<i>Sphaeranthus(LIV)</i>
31b	Heads solitary, many flowered, arranged in lax panicles or corymbs	32
32a	Leaves decurrent	<i>Laggera(XLII)</i>
32b	Leaves not decurrent	33

33a	Anthers tailed	<i>Blumea(XI)</i>
33b	Anthers not tailed	<i>Blumeopsis(XII)</i>
34a	Leaves usually alternate	35
34b	Leaves usually opposite	45
35a	Style arms truncate or appendiculate	36
35b	Style arms flattened or plano-convex	41
36a	Pappus of fine capillary hairs or bristles	<i>Senecio(L)</i>
36b	Pappus absent (sometimes short auriculate in <i>Cotula</i>).	37
37a	Heads many	<i>Artemisia(VII)</i>
37b	Heads solitary	38
38a	Involucral bracts many seriate, incurved in fruits	<i>Sphaeromorphaea(LV)</i>
38b	Involucral bracts sub 2-seriate, not incurved in fruits	39
39a	Stoloniferous; heads sessile; corolla of outer florets wanting	<i>Soliva(LII)</i>
39b	Non stoloniferous; heads sessile or peduncled; corolla of outer florets usually present	40
40a	Leaves toothed or lobed; heads sessile or sub-sessile; involucral bracts 2-seriate; achenes angled, not stipitate	<i>Centipeda(XVI)</i>
40b	Leaves pinnatifid or pinnatisect; heads peduncled; involucral bracts sub-2-seriate; achenes compressed, stipitate	<i>Cotula(XX)</i>
41a	Ray florets absent	42
41b	Ray florets present	44
42a	Pappus a short tube with fimbriate mouth	<i>Grangea(XXXV)</i>
42b	Pappus absent	43
43a	Receptacles flat; achenes with thickened margins	<i>Dichrocephala(XXIII)</i>
43b	Receptacles conical or convex; achenes without thickened margins	<i>Cyathocline(XXII)</i>
44a	Heads in corymbose or panicles; involucral bracts many seriate; ligules indistinct	<i>Conyza(XVIII)</i>
44b	Heads solitary or few in lax racemes; involucral bracts 2-3-seriate; ligules distinct	<i>Erigeron(XXIX)</i>
45a	Filaments papillose or pubescent	<i>Cosmos(XIX)</i>
45a	Filaments glabrous	46
46a	Heads in terminal glomerules, one flowered	<i>Flaveria(XXXI)</i>
46b	Heads non-glomerulate, more than one flowered	47
47a	Leaves divided to the base or deeply pinnatifid	48
47b	Leaves simple or pinnately compound	49
48a	Achenes linear, with retrorsely barbed pappus awns	<i>Bidens(IX)</i>
48b	Achenes somewhat rounded, without retrorsely barbed pappus awns	<i>Parthenium(XLV)</i>
49a	Ray florets only fertile; achenes trigonous, covered with hooked bristles	<i>Acanthospermum(I)</i>
49b	Ray florets sterile or fertile; achenes not trigonous (except <i>Spilanthes</i>), not covered with hooked bristles	50
50a	Disc achenes rounded or laterally compressed; pappus absent or of 2 short, weak awns	51
50b	Disc achenes dorsally compressed or angular; pappus present or absent	57
51a	Outer involucral bracts clavate, spreading; inner ones enclosing the achenes	52
51b	Outer involucral bracts not clavate, erect; inner ones not enclosing the achenes	53

52a	Terrestrial herbs; outer involucre bracts prominently glandular	<i>Sigesbeckia</i> (LI)
52b	Marshy herbs; outer involucre bracts eglandular	<i>Enydra</i> (XXVIII)
53a	Receptacles flat, never conical	54
53b	Receptacle convex or conical	56
54a	Paleas bristle or awn like	<i>Eclipta</i> (XXV)
54b	Paleas linear or oblanceolate, concave or folded	55
55a	Flowers white; paleas obtuse, lacerate; pappus of 2-5 unequal bristles	<i>Blainvillea</i> (X)
55b	Flowers yellow; paleas acute, entire; pappus cup like or of 1-2 weak awns or absent	<i>Wedelia</i> (LX)
56a	Receptacles convex; achenes enclosed in hardened, pointed palea	<i>Sclerocarpus</i> (XLIX)
56b	Receptacles conical; achenes not enclosed	<i>Acmella</i> (II)
57a	Pappus of 2-3 bristles or awns (lacking in <i>Chrysanthellum</i> and <i>Guizotia</i>).	58
57b	Pappus consisting of 5 or more bristles or scales	61
58a	Achenes compressed	59
58b	Achenes fusiform, angular	60
59a	Margins of achenes lacinate winged; pappus of 2 unbarbed awns	<i>Synedrella</i> (LVI)
59b	Margins of achenes not lacinate winged; pappus awns absent	<i>Guizotia</i> (XXXVI)
60a	Achenes often dimorphic; pappus absent	<i>Chrysanthellum</i> (XVII)
60b	Achenes not dimorphic; pappus present	<i>Glossocardia</i> (XXXIII)
61a	Erect, annual herbs; pappus of short fimbriate scales, c. 1 mm long	<i>Galinsoga</i> (XXII)
61b	Prostrate, ascending, perennial herbs; pappus of fine plumose bristles, c. 5 mm long	<i>Tridax</i> (LVIII)

I. ACANTHOSPERMUM Schrank

Eight species distributed in tropical America (Mabberly, 2008); 1 species in India (Karthikeyan et al., 2009); 1 species in Jharkhand.

1. *A. hispidum* DC. *Fl. and Fr.*: Aug-Feb. *Distrib.*: Chota Nagpur, Hazaribagh, Koderma, Ranchi.

Key to the species

1a	Achenes eciliate; pappus absent	<i>A. calva</i>
1b	Achenes ciliate; pappus present	2
2a	Heads radiate	<i>A. uliginosa</i>
2b	Heads discoid	<i>A. oleracea</i>

2. *A. calva* (DC.) R.K. Jansen *Fl. and Fr.*: February - August. *Distrib.*: Palamau, Santal Pargana.

3. *A. oleracea* (L.) R.K. Jansen *Fl. and Fr.*: Throughout the year.

Distrib.: Almost throughout the state.

4. *A. uliginosa* (Sw.) Cass. *Fl. and Fr.*: Mar - Sept.

Distrib.: Ranchi.

II. ACMELLA Rich. exPers.

About 30 species, distributed in tropical regions (Mabberly, 2008); 4 species in India (Karthikeyan et al., 2009); 3 species in Jharkhand.

III. ADENOSTEMMA J.R. Forst. and G. Forst.

About 20 species, distributed in America, Asia (Mabberly, 2008); 2 species and 8 varieties in India (Karthikeyan et al., 2009); 1 species in Jharkhand.

5. *A. lavenia* (L.) Kuntze *Fl. and Fr.*: Oct-Jan.

Distrib.: Hazaribagh.

IV. AGERATUM L.

About 40 species, mainly distributed in Tropical America, now widespread Pantropical

(Mabberley, 2008); 2 species in India (Karthikeyan et al., 2009); 2 species in Jharkhand.

Key to the species

1a	Involucral bracts narrowly lanceolate, apex long acuminate, pilose; corolla equal to or longer than pappus scale	<i>A. houstonianum</i>
1b	Involucral bracts broad, oblong or lanceolate-oblong, apex acute, glabrous; corolla shorter than pappus scale	<i>A. conyzoides</i>

6. *A. houstonianum* Mill. Fl. and Fr.: November - December.

species in India (Karthikeyan et al., 2009); 1 species in Jharkhand.

Distrib.: Chota Nagpur.

8. *A. ramosa* (Roxb.) Jafri Fl. and Fr.: Aug - Jan.

7. *A. conyzoides* L. Fl. and Fr.: Almost throughout the year.

Distrib.: Ranchi.

Distrib.: Throughout the state.

VI. ANAPHALIS DC.**V. AMBERBOA (Pers.) Less.**

About 20 species, distributed in Mediterranean to C. Asia (Mabberley, 2008); 2

About 40 species, distributed in Asia, America and Europe (Mabberley, 2008); 37 species and 5 varieties in India (Karthikeyan et al., 2009); 2 species in Jharkhand.

Key to the species

1a	Leaves 1-nerved; bracts clawed	<i>A. adnata</i>
1b	Leaves 3-nerved; bracts not clawed	<i>A. contorta</i>

9. *A. adnata* DC. Fl. and Fr.: August - March.

VII. ARTEMISIAL.

Distrib.: Chota Nagpur

About 400 species, distributed in north temperate regions, W. S. America and south Africa (Mabberley, 2008); 46 species, 19 varieties and 3 forma in India (Karthikeyan et al., 2009); 4 species in Jharkhand.

10. *A. contorta* (D. Don) Hook.f. Fl. and Fr.: July - March.

Distrib.: Giridih, Hazaribagh.

Key to the species

1a	Undershrubs, up to 2 m tall	<i>A. japonica</i>
1b	Herbs, up to 1.5m tall	2
2a	Involucre hemispheric	<i>A. caruifolia</i>
2b	Involucre ovoid or campanulate or subglobose	3
3a	Disc florets 8-12, bisexual	<i>A. indica</i>
3b	Disc florets 5-7, unisexual (male)	<i>A. capillaris</i>

11. *A. capillaris* Thunb.

13. *A. indica* Willd.

Fl. and Fr.: August - December. Distrib.: Palamau.

Fl. and Fr.: August - December. Distrib.: Palamau.

12. *A. caruifolia* Buch.-Ham.

14. *A. japonica* Thumb.

Fl. and Fr.: March - April. Distrib.: Hazaribagh, Santal Pargana, Sahibganj.

Fl. and Fr.: April - December. Distrib.: Hazaribagh, Palamau, Ranchi, Giridih.

VIII. ATHROISMA DC.

About 8 species, distributed in tropical Africa, Asia, Indonesia and Malaya (Mabberley, 2008); 1 species in India (Karthikeyan et al., 2009); 1 species in Jharkhand.

15. *A. laciniatum* DC.

Fl. and Fr.: April - June. *Distrib.*: Sahibganj.

IX. BIDENS L.

About 230 species, distributed throughout the world (Mabberley, 2008); 12 species and 2 varieties in India (Karthikeyan et al., 2009); 2 species in Jharkhand.

Key to the species

1a	Leaves 3-5 partite or undivided; phyllaries spatulate	<i>B. pilosa</i>
1b	Leaves pinnate or bipinnate; phyllaries linear	<i>B. biternata</i>

16. *B. biternata* (Lour.) Merr. and Sherff

Fl. and Fr.: April - October.

Distrib.: Hazaribagh, Palamau, Giridih.

17. *B. pilosa* L.

Fl. and Fr.: March - December.

Distrib.: Hazaribagh, Palamau, Santal Pargana.

2008); 1 species in India (Karthikeyan et al., 2009); 1 species in Jharkhand.

18. *B. acmella* (L.) Philipson

Fl. and Fr.: August - January. *Distrib.*: Hazaribagh, Palamau, Ranchi.

XI. BLUMEA DC.

About 100 species distributed in Old World Tropics and S. Africa (Mabberly, 2008); 32 species in India (Karthikeyan et al., 2009); 14 species and 3 varieties in Jharkhand.

X. BLAINVILLEA Cass.

Pantropical; c. 10 species (Mabberley,

Key to the species

1a	Plants densely white woolly all over	2
1b	Plants glabrate or variously pubescent but never woolly all over	3
2a	Leaves spiny toothed; corolla of bisexual florets hairy on tube and lobes	<i>B. malcolmii</i>
2b	Leaves not spiny toothed; corolla of bisexual florets hairy only on lobes	<i>B. hieracifolia</i>
3a	Corolla lobes of bisexual florets with multicellular hairs in addition to colleters	<i>B. obliqua</i>
3b	Corolla lobes of bisexual florets glabrous or with unicellular hairs in addition to colleters	4
4a	Outer involucral bracts oblong-ovate to oblong-lanceolate	<i>B. procera</i>
4b	All involucral bracts linear or lanceolate	5
5a	Receptacles fimbriate	<i>B. aromatica</i>
5b	Receptacles glabrous or pilose	6
6a	Heads glomerulate, clusters interruptly spicate	<i>B. fistulosa</i>
6b	Heads paniculate	7
7a	Leaves spiny toothed; corolla hairy	.8
7b	Leaves not spiny toothed; corolla of female florets glabrous	9
8a	Prostrate herbs with branches radiating from the rootstock; leaves irregularly dentate; corolla hairy on lobes	<i>B. oxyodonta</i>
8b	Erect herbs; leaves alternately long and short toothed; corolla hairy all over	<i>B. eriantha</i>
9a	Receptacles minutely pilose	<i>B. laciniata</i>
9b	Receptacles glabrous	10
10a	Achenes ribbed	11

10b	Achenes not ribbed	13
11a	Outer bracts with purple margins; pappus exceeding the corolla	<i>B. atropurpurea</i>
11b	Outer bracts without purple margins; pappus shorter or equal to corolla	12
12a	Plants glabrous	<i>B. virens</i>
12b	Plants pubescent or glandular	<i>B. membranacea</i>
13a	Leaves not lyrate lobed; heads purple	<i>B. mollis</i>
13b	Leaves lyrate lobed; heads yellow	<i>B. lacera</i>

19. *B. aromatica* DC.

Fl. and Fr.: November - April.

Distrib.: Chota Nagpur.

20. *B. atropurpurea* Haines

Fl. and Fr.: December - March. *Distrib.*: Giridih.

21. *B. eriantha* DC.

Fl. and Fr.: December - April. *Distrib.*: Hazaribagh, Palamau, Singhbhum.

22. *B. fistulosa* (Roxb.) Kurz

Fl. and Fr.: December - April. *Distrib.*: Hazaribagh, Palamau, Ranchi, Sahibganj, Singhbhum.

Key to the varieties

1a	Plants white woolly; leaves usually radical, obscurely dentate; involucre bracts usually straw coloured	<i>var. hamiltoni</i>
1b	Plants silky-sericeous; leaves mostly cauline, distinctly irregularly serrate-dentate; involucre bracts usually purple-tipped	<i>var. hieracifolia</i>

B. hieracifolia (D. Don) DC.

23. *B. hieracifolia* var. *hamiltoni* (DC.) C.B. Clarke

Fl. and Fr.: March - June. *Distrib.*: Palamau.

24. *B. hieracifolia* var. *hieracifolia*

Fl. and Fr.: February - June. *Distrib.*: Hazaribagh.

25. *B. lacera* (Burm.f.) DC.

Fl. and Fr.: January - April. *Distrib.*: Hazaribagh, Koderma, Palamau and Singhbhum

26. *B. laciniata* (Roxb.) DC.

Fl. and Fr.: March - April.

Distrib.: Hazaribagh and Palamau.

27. *B. malcolmii* (C.B. Clarke) Hook.f.

Fl. and Fr.: December - March.

Distrib.: Chota nagpur.

B. membranacea DC.

Key to the varieties

1a	Plants glandular pubescent; leaves elliptic-ovate or lanceolate	<i>var. muralis</i>
1b	Plants simple pubescent; leaves obovate or obovate to lanceolate	2
2a	Plants slender, pubescent; leaves obovate; involucre bracts herbaceous; heads 5-6 mm across	<i>var. membranacea</i>
2b	Plants robust, strigose; leaves obovate to lanceolate; involucre bracts rigid; heads 7-8 mm across	<i>var. jacquemontii</i>

28. *B. membranacea* var. *jacquemontii* (Hook.f.) Randeria

Fl. and Fr.: December - April.

Distrib.: Hazaribagh, Palamau.

29. *B. membranacea* var. *membranacea*

Fl. and Fr.: November - April.

Distrib.: Hazaribagh, Singhbhum.

30. *B. membranacea* var. *muralis* (DC.) Hook.f.

Fl. and Fr.: January - April.

Distrib.: Hazaribagh, Palamau.

31. *B. mollis* (D. Don) Merr.

Fl. and Fr.: December - April.

Distrib.: Hazaribagh, Palamau.

32. *B. obliqua* (L.) Druce

Fl. and Fr.: February - March. *Distrib.*: Palamau.

33. *B. oxyodonta* DC.

Fl. and Fr.: January - April.

Distrib.: Hazaribagh, Palamau and Singhbhum.

34. *B. procera* DC.

Fl. and Fr.: December - April. *Distrib.*: Sahibganj.

35. *B. virens* DC.

Fl. and Fr.: December - March. *Distrib.*: Hazaribagh.

XII. BLUMEOPSIS Gagnep.

One species in India to Western Malasia (Mabberly, 2008); 1 species in India (Karthikeyan et al., 2009); 1 species in Jharkhand.

36. *B. flava* (DC.) Gagnep.

Fl. and Fr.: November - January. *Distrib.*: Chota Nagpur and Santal Pargana.

XIII. CAESULIA Roxb.

One species in NE India (Mabberly, 2008); a monotypic genus of the Indian subcontinent (Pant, 1995; Karthikeyan et al., 2009).

37. *C. axillaris* Roxb.

Fl. and Fr.: August - February. *Distrib.*: Throughout the state.

XIV. CARPESIMUM L.

Twenty five species distributed in Eurasia, Indo-malaysia to Australia (Mabberly, 2008); 6 species in India (Karthikeyan et al., 2009); 1 species in Jharkhand.

Key to the species

1a	Leaf base amplexicaul	2
1b	Leaf base not amplexicaul	3
2a	Radical leaves withered at anthesis; leaves pinnately cleft; heads more than 1 cm across	<i>C. aegyptiaca</i>
2b	Radical leaves persistent at anthesis; leaves dentate; heads less than 1 cm across	<i>C. japonica</i>
3a	Corolla of outer florets less than half to style and pappus	<i>C. leucantha</i>

38. *C. cernuum* L.

Fl. and Fr.: December - February.

Distrib.: Santal Pargana.

XV. CARTHAMUS L.

About 13 species, distributed in Mediterranean regions, Africa and Asia (Mabberly, 2008); 3 species in India (Karthikeyan et al., 2009); 1 species in Jharkhand.

39. *C. tinctorius* L.

Fl. and Fr.: February - April.

Distrib.: Hazaribagh, Palamau.

XVI. CENTIPEDA Lour.

About fivespecies, distributed in Madagascar, Afghanistan, Indomalesia, Australia, New Zealand, Polynesia and Chile (Mabberly, 2008); 1 species in India (Karthikeyan et al., 2009); 1 species in Jharkhand.

40. *C. minima* (L.) A. Br. and Aschers.

Fl. and Fr.: March - January.

Distrib.: Hazaribagh, Koderma, Lohardaga, Ranchi, Sahibganj, Singhbhum.

XVII. CHRYSANTHELLUM Rich.

About 6 species, distributed throughout the world (Mabberly, 2008); 1 species in India (Karthikeyan et al., 2009); 1 species in Jharkhand.

41. *C. americanum* (L.) Vatke

Fl. and Fr.: August - December. *Distrib.*: Hazaribagh, Koderma, Palamau, Singhbhum.

XVIII. CONYZA Less.

About 60 species, distributed in temperate and subtropical regions, temperate and warm Africa (Mabberly, 2008); 9 species and 1 variety in India (Karthikeyan et al., 2009); 6 species in Jharkhand.

3b	Corolla of outer florets nearly equalling to style and pappus	4
4a	Pappus white	<i>C. canadensis</i>
4b	Pappus yellow or reddish	5
5a	Pappus reddish, c. 1 mm long	<i>C. stricta</i>
5b	Pappus yellow, 3-3.5 mm long	<i>C. bonariensis</i>

42. *C. aegyptiaca* (L.) Aiton

Fl. and Fr.: August - May.

Distrib.: Palamau, Giridih.

43. *C. bonariensis* (L.) Cronquist

Fl. and Fr.: August - February.

Distrib.: Palamau, Sahibganj, Giridih, Hazaribagh.

44. *C. canadensis* (L.) Cronquist

Fl. and Fr.: June - August. *Distrib.*: Palamau.

45. *C. japonica* (Thunb.) Less. ex DC.

Fl. and Fr.: May - Oct. *Distrib.*: Hazaribagh, Palamau.

Key to the species

1a	Ray laminae yellow to red-orange; peduncles with one or more leafy bracts	<i>C. sulphureus</i>
1b	Ray laminae pink, purple, purplish, rose-pink, violet or white; peduncles without leafy bracts	<i>C. caudatus</i>

48. *C. caudatus* Kunth

Fl. and Fr.: December - February. *Distrib.*: Santal Pargana.

49. *C. sulphureus* Cav.

Fl. and Fr.: December - February. *Distrib.*: Hazaribagh.

XX. COTULA L.

About 50 species, distributed in Southern hemisphere to N. Africa and Mexico (Mabberley, 2008); 6 species in India (Karthikeyan et al., 2009); 1 species in Jharkhand.

50. *C. anthemoides* L.

Fl. and Fr.: December - March. *Distrib.*: Koderma, Giridih.

XXI. CRASSOCEPHALUM Moench

About 30 species distributed in Africa, Madagascar and in warm Africa to Yemen and

46. *C. leucantha* (D. Don) Ludlow and Raven

Fl. and Fr.: December - March.

Distrib.: Hazaribagh, Palamau, Singhbhum, Giridih.

47. *C. stricta* Willd.

Fl. and Fr.: August - October. *Distrib.*: Giridih.

XIX. COSMOS Cavanilles

About 25 species, distributed in tropical America, West Indies, Asia (Mabberley, 2008); 3 species in India (Karthikeyan et al., 2009); 2 species in Jharkhand.

Mascarenes (Mabberley, 2008); 1 species in India (Karthikeyan et al., 2009); 1 species in Jharkhand.

51. *C. crepidioides* (Benth.) S. Moore

Fl. and Fr.: December - January. *Distrib.*: Singhbhum, Gumla.

XXII. CYATHOCLINE Cass.

About 3 species, distributed in tropical Asia (Mabberley, 2008); 2 species and 2 varieties in India (Karthikeyan et al., 2009); 1 species in Jharkhand.

52. *C. purpurea* (Buch.-Ham. ex D. Don) Kuntze

Fl. and Fr.: December - March. *Distrib.*: Giridih, Hazaribagh, Lohardaga, Palamau, Santal Pargana, Singhbhum.

XXIII. DICHROCEPHALA L'Herit ex DC.

About 10 species, distributed in Africa, Madagascar, China, India (Mabberley, 2008); 4 species and 1 subspecies in India (Karthikeyan et al., 2009); 1 species in Jharkhand.

53. *D. chrysanthemifolia* (Blume) DC.

Fl. and Fr.: December. *Distrib.*: Hazaribagh.

XXIV. ECHINOPS L.

About 100 species, distributed in Mediterranean regions, Europe, Africa and Asia (Mabberley, 2008); 4 species in India (Karthikeyan et al., 2009); 1 species in Jharkhand.

54. *E. echinatus* Roxb.

Fl. and Fr.: March - July.

Distrib.: Hazaribagh, Koderma.

XXV. ECLIPTA L.

About 4 species, distributed in warmer regions of America, Africa, Australia and Asia (Mabberley, 2008); 1 species in India (Karthikeyan et al., 2009); 1 species in Jharkhand.

55. *E. prostrata* (L.) L.

Fl. and Fr.: Throughout the year.

Distrib.: Throughout the state.

XXVI. ELEPHANTOPUS L.

About 25 species, distributed in tropics and warmer temperate regions of both hemispheres (Mabberley, 2008); 1 species in India including Jharkhand (Karthikeyan et al., 2009); 1 species in Jharkhand.

56. *E. scaber* L.

Fl. and Fr.: August - December.

Distrib.: Koderma, Dalma, Gumla.

Key to the species

1a	Leaves 3-5-fid	<i>E. mairei</i> var. <i>heterophyllum</i>
1b	Leaves entire or undivided	2
2a	Achenes with shining glands	<i>E. nodiflorum</i>
2b	Achenes without glands	<i>E. odoratum</i>

60. *E. mairei* H. Lev. var. *heterophyllum* (DC.) Karthik and Moorthy

Fl. and Fr.: July-September. *Distrib.*: Palamau.

61. *E. nodiflorum* Wall. ex DC.

XXVII. EMILIA Cass.

About 30 species, distributed in S. Africa. S. China, Japan, Phillipines and Sri Lanka and in Old world tropical countries (Mabberley, 2008); 8 species and 2 varieties in India (Karthikeyan et al., 2009); 1 species in Jharkhand.

57. *E. sonchifolia* (L.)DC.

Fl. and Fr.: March - January.

Distrib.: Hazaribagh, Koderma, Gumla.

XXVIII. ENYDRA DC.

About 10 species, distributed in warmer parts of the world (Mabberley, 2008); 1 species in India (Karthikeyan et al., 2009); 1 species in Jharkhand.

58. *E. fluctuans* Lour.

Fl. and Fr.: December -January.

Distrib.: Ranchi.

XXIX. ERIGERON L.

About 390 species, distributed throughout the world, especially N. America and C. America (Mabberley, 2008); 21 species and 2 varieties in India (Karthikeyan et al., 2009); 1 species in Jharkhand.

59. *E. sublyratus* DC.

Fl. and Fr.: October - April. *Distrib.*: Singhbhum.

XXX. EUPATORIUM L.

About 1200 species (before segregation), distributed in Europe, Asia, Africa, chiefly in Mexico, West Indies and Tropical S. America (Mabberley, 2008); 11 species and 1 variety in India (Karthikeyan et al., 2009); 2 species and 1 variety in Jharkhand.

Fl. and Fr.: December - February. *Distrib.*: Palamau.

62. *E. odoratum* L.

Fl. and Fr.: February - May. *Distrib.*: Chota Nagpur.

XXXI. FLAVERIA Juss.

About 21 species, distributed in America, Australia (Mabberley, 2008); 2 species in India (Karthikeyan et al., 2009); 1 species in Jharkhand.

63. *F. trinervia* (Spreng.) C. Mohr

Fl. and Fr.: March - October. *Distrib.:* Chota Nagpur.

XXXII. GALINSOGA Ruiz and Pavon

Thirteen species distributed in temperate and

subtropical Central and South America (Mabberly, 2008); 2 species in India (Karthikeyan et al., 2009); 1 species in Jharkhand.

64. *G. parviflora* Cav.

Fl. and Fr.: August - February. *Distrib.:* Palamau, Ranchi.

XXXIII. GLOSSOCARDIA Cass.

About 12 species, distributed in S.E. Asia. Africa (Mabberley, 2008); 2 species in India (Karthikeyan et al., 2009); 2 species in Jharkhand.

Key to the species

1a	Plants woody at base; achenes not compressed, linear-oblong, 5-ribbed on both faces	<i>G. bidens</i>
1b	Plants herbaceous at base; achenes dorsally compressed, narrowly oblong, not ribbed	<i>G. bosvallea</i>

65. *G. bidens* (Retz.) Veldkamp

Fl. and Fr.: March - December. *Distrib.:* Gumla, Hazaribagh, Koderma, Palamau, Ranchi.

Distrib.: Lohardaga, Palamau, Ranchi, Hazaribagh, Singhbhum.

XXXIV. GNAPHALIUM L.

About 300 species, cosmopolitan in distribution (Mabberley, 2008); 4 species in India (Karthikeyan et al., 2009); 7 species in Jharkhand.

66. *G. bosvallea* (L.f.) DC.

Fl. and Fr.: September - October.

Key to species

1a	Heads in leafless corymbs, clustered	<i>G. luteo-album</i>
1b	Heads in spikes or panicles, lax	2
2a	Stout herbs; leaf base semi-amplexicaul, more or less decurrent	<i>G. hypoleucum</i>
2b	Slender herbs; leaf base attenuate or narrowed to the stem	3
3a	Lower surface of leaves white pannose, the sub-apressed hairs tightly emeshed	<i>G. purpureum</i>
3b	Lower surface of leaves loosely villose, lanate to appressed white tomentose	4
4a	Pappus hairs free at base	<i>G. polycaulon</i>
4b	Pappus hairs coherent at base	5
5a	Leaves flaccid	<i>G. flaccidum</i>
5b	Leaves not flaccid	6
6a	Stems erect or decumbent, branching from base; disc florets 2-3, c. 2.25 mm long	<i>G. pensylvanicum</i>
6b	Stems prostrate; disc florets 4-5, c. 1 mm long	<i>G. pulvinatum</i>

67. *G. flaccidum* Kurz

Fl. and Fr.: February - March. *Distrib.:* Giridih.

69. *G. luteo-album* L.

Fl. and Fr.: January - April.

68. *G. hypoleucum* DC. *Fl. and Fr.:* May - October.

Distrib.: Throughout the state.

Distrib.: Giridih, Hazaribagh.

70. *G. pensylvanicum* Willd.

Fl. and Fr.: January - November. *Distrib.:* Hazaribagh.

71. *G. polycaulon* Pers.

Fl. and Fr.: Throughout the year.

Distrib.: Hazaribagh, Palamau, Singhbhum.

72. *G. pulvinatum* Del.

Fl. and Fr.: December - March. *Distrib.:* Palamau.

73. *G. purpureum* L.

Fl. and Fr.: August - May. *Distrib.:* Hazaribagh, Palamau, Singhbhum, Giridih.

XXXV. GRANGEA Adans.

About 6 species, distributed in tropical Asia and Africa (Mabberley, 2008); 1 species in India (Karthikeyan et al., 2009); 1 species in Jharkhand.

Key to the species

1a Herbs; achenes blackish, oblong, 2-3 mm long, faintly ribbed	<i>G. bicolor</i>
1b Shrubs; achenes dark brown, cylindrical, 4-6 mm long, prominently ribbed	<i>G. nepalensis</i>

76. *G. bicolor* (Roxb. ex Willd.) DC.

Fl. and Fr.: August - January. *Distrib.:* Singhbhum

77. *G. nepalensis* DC.

Fl. and Fr.: December - March. *Distrib.:* Chota Nagpur.

Key to the species

1a Herbs	2
1b Shrubs or undershrubs	3
2a Stem branched from a woody root stock; ligules yellow; ray florets up to 8 mm long; pappus pale red	<i>I. obtusifolia</i>
2b Stem simple; ligules white; ray florets 11-12 mm long; pappus white	<i>I. nervosa</i>
3a Leaves silky villous or woolly below; heads discoid; pappus white	<i>I. cappa</i>
3b Leaves glabrous or pubescent on both surfaces but not white woolly; heads radiate; pappus pale brown	<i>I. eupatorioides</i>

78. *I. cappa* DC.

Fl. and Fr.: October - December. *Distrib.:* Palamau.

79. *I. eupatorioides* DC.

Fl. and Fr.: November - December.

74. *G. maderaspatana* (L.) Poir.

Fl. and Fr.: November - April. *Distrib.:* Santal Pargana, Singhbhum, Palamau, Hazaribagh.

XXXVI. GUIZOTIA Cass.

Six species distributed in Africa (Mabberly, 2008); 1 species in India (Karthikeyan et al., 2009); 1 species in Jharkhand.

75. *G. abyssinica* (L.f.) Cass.

Fl. and Fr.: October - February. *Distrib.:* Chota Nagpur, Giridih, Gumla, Palamau, Ranchi, Singhbhum.

XXXVII. GYNURA Cass.

About 100 species distributed in Asia, Africa, Australia, Malaysia, China, Nepal and Sri Lanka (Mabberley, 2008); 8 species in India (Karthikeyan et al., 2009); 2 species in Jharkhand.

XXXVIII. INULA L.

About 50 species distributed in temperate and subalpine regions of Europe, Africa and Asia; 17 species in India (Karthikeyan et al., 2009); 4 species in Jharkhand.

Distrib.: Chota Nagpur.

80. *I. nervosa* Wall. ex DC.

Fl. and Fr.: August - October.

Distrib.: Palamau.

81. *I. obtusifolia* Kemer

Fl. and Fr.: August - October. *Distrib.*: Koderma.

XXXIX. IXERIS (Cass.) Cass.

About 20 species, distributed in Himalayan region to Japan (Mabberley, 2008); 1 species in India (Mamgain and Rao, 1995; Karthikeyan et al., 2009); 1 species in Jharkhand.

82. *I. polycephala* Cass.

Fl. and Fr.: December - March. *Distrib.*: Palkot

XL. LACTUCA L.

About 50 species, distributed throughout the world (Mabberley, 2008); 5 species, 1 subspecies and 1 variety in India (Karthikeyan et al., 2009); 1 species in Jharkhand.

Key to the species

1a	Stem not winged; corolla of bisexual florets pi006Ek; achenes sub-compressed	<i>L. aurita</i>
1b	Stem winged; corolla of bisexual florets bluish purple; achenes faintly ribbed	2
2a	Wings of stem broad, entire and continuous; pappus 6-7 mm lo	<i>L. alata</i>
2b	Wings of stem narrow, toothed and interrupted; pappus 4-5 mm long	<i>L. crispata</i>

85. *L. alata* (D. Don) Sch.-Bip. ex Oliver

Fl. and Fr.: November - January.

Distrib.: Giridih, Palamau.

86. *L. aurita* L.f.

Fl. and Fr.: December - March.

Distrib.: Koderma, Singhbhum.

Key to the species

1a	Achenes prominent lyribbed	2
1b	Achenes rugose/rugulose	4
2a	Ligules pink	<i>L. intybacea</i>
2b	Ligules yellowish	3
3a	Achenes sub-compressed	<i>L. acaulis</i>
3b	Achenes columnar	<i>L. sarmentosa</i>
4a	Herbs with procumbent to erect stems or acaulescent	<i>L. procumbens</i>
4b	Herbs with thick root stock	<i>L. asplenifolia</i>

83. *L. serriola* Tourner

Fl. and Fr.: April - October. *Distrib.*: Giridih.

XLI. LAGASCEA Cav.

About 15 species, distributed in Mexico, tropical S. America to West Indies (Mabberley, 2008); 1 species in India (Karthikeyan et al., 2009); 1 species in Jharkhand.

84. *L. mollis* Cav.

Fl. and Fr.: August - December.

Distrib.: Palamau, Ranchi.

XLII. LAGGERA Sch.-Bip. ex Koch

Seventeen species distributed in Old World tropical countries (Mabberley, 2008); 2 species in India (Karthikeyan et al., 2009); 3 species in Jharkhand.

87. *L. crispata* (Vahl) Hepper and Wood

Fl. and Fr.: December - April. *Distrib.*: Palamau, Ranchi, Singhbhum.

XLIII. LAUNAEA Cass.

About 45 species, distributed in S.E. Asia, C. Asia, Europe and Africa (Mabberley, 2008); 9 species in India (Karthikeyan et al., 2009); 5 species in Jharkhand.

88. *L. acaulis* (Roxb.) Babe ex Kerr

Fl. and Fr.: March - June.

Distrib.: Hazaribagh, Singhbhum.

89. *L. aspleniifolia* (Willd.) Hook.f.

Fl. and Fr.: January - April.

Distrib.: Hazaribagh

90. *L. intybacea* (Jacq.) Beauverd

Fl. and Fr.: September - December.

Distrib.: Palkot, Koderma, Dalma.

91. *L. procumbens* (Roxb.) Ramayya and Rajagopal

Fl. and Fr.: March - September. *Distrib.*: Palamau, Singhbhum, Hazaribagh, Koderma.

92. *L. sarmentosa* (Willd.) Sch.-Bip. ex Kuntze

Fl. and Fr.: June - September.

Distrib.: Singhbhum, Palamau.

Key to the species

1a	Involucral bracts acute with erect tip, glabrous; ligules lanceolate; ray florets epappose	<i>P. indicum</i>
1b	Involucral bracts acuminate with recurved tip, hairy; ray florets pappose	2
2a	Plants sparsely pubescent; lower leaves sub-sessile; leaf apex acuminate	<i>P. cernuum</i>
2b	Plants softly woolly; all leaves sessile; leaf apex obtuse to sub-acute	<i>P. vestitum</i>

95. *P. cernuum* (Dalzell) Ling

Fl. and Fr.: November - February. *Distrib.*: Giridih.

96. *P. indicum* (L.) Ling

Fl. and Fr.: October - February. *Distrib.*: Hazaribagh, Koderma, Palamau, Ranchi, Singhbhum.

97. *P. vestitum* (Wall. ex DC.) Ling

Key to the species

1a	Ray florets ligulate	<i>P. angustifolia</i>
1b	Ray florets tubular	<i>P. foliolosa</i>

98. *P. angustifolia* DC.

Fl. and Fr.: May - October. *Distrib.*: Lohardaga, Palamau, Ranchi.

XLIV. MIKANIA Willd.

About 300 species, distributed in United States through Mexico, central America and W. Indies to S. America, few species in E. Hemisphere (Mabberley, 2008); 2 species in India (Karthikeyan et al., 2009); 1 species in Jharkhand.

93. *M. micrantha* Kunth

Fl. and Fr.: December - March. *Distrib.*: Palamau.

XLV. PARTHENIUM L.

About 16 species, distributed in N. America and West Indies (Mabberley, 2008); 1 species in India (Karthikeyan et al., 2009); 1 species in Jharkhand.

94. *P. hysterophorus* L. *Fl. and Fr.*: July - March. *Distrib.*: Hazaribagh, Palamau.

XLVI. PENTANEMA Cass.

Eighteen species distributed in Turkey and Central Asia to Sri Lanka (Mabberly, 2008); 3 species in India (Karthikeyan et al., 2009); 3 species in Jharkhand.

Fl. and Fr.: February - May.

Distrib.: Santal Pargana.

XLVII. PULICARIA Gaertn.

Seventy seven species distributed in temperate region and warm Eurasia (Mabberly, 2008); 12 species in India (Karthikeyan et al., 2009); 2 species in Jharkhand.

99. *P. foliolosa* DC.

Fl. and Fr.: April - June. *Distrib.*: Hazaribagh.

XLVIII. SAUSSUREA DC.

About 403 species, distributed in temperate Asia, Australia, Europe and N. America (Mabberley, 2008); 69 species and 7 varieties in India (Karthikeyan et al., 2009); 1 species in Jharkhand.

100. *S. heteromalla* (D. Don) Hand.-Mazz.

Fl. and Fr.: March - May. *Distrib.*: Palamau.

XLIX. SCLEROCARPUS Jacq.

About 8 species, distributed in tropical and

warm America, Africa (Mabberley, 2008); 1 species in India (Karthikeyan et al., 2009); 1 species in Jharkhand.

101. *S. africanus* Jacq. ex Murray

Fl. and Fr.: March - July. *Distrib.*: Ranchi.

L. SENECIO L.

About 1000 species (Mabberley, 2008); 43 species in India (Mathur, 1995); 48 species, 1 subspecies and 6 varieties in India (Karthikeyan et al., 2009); 3 species in Jharkhand.

Key to the species

1a	Stems glabrous or sparsely arachnoid tomentose; leaves cuneate or amplexicaul at base; involucre bracts 12-14	<i>S. nudicaulis</i>
1b	Stems sparsely pubescent when young; leaves truncate or slightly cordate or attenuate at base; involucre bracts 8-10	<i>S. wightianus</i>

102. *S. nudicaulis* Buch.-Ham. ex D. Don

Fl. and Fr.: March - June.

Distrib.: Hazaribagh, Palamau.

103. *S. wightianus* DC. ex Wight

Fl. and Fr.: September - December.

Distrib.: Singhbhum.

LI. SIGESBECKIA L.

About 12 species distributed in tropical countries (Mabberley, 2008); 1 species in India (Karthikeyan et al., 2009); 1 species in Jharkhand.

104. *S. orientalis* L.

Fl. and Fr.: April - December.

Distrib.: Throughout the state.

LII. SOLIVA Ruiz and Pavon

About 8 species, distributed in S. America (Mabberley, 2008); 1 species in India (Karthikeyan et al., 2009); 1 species in Jharkhand.

105. *S. anthemifolia* (Juss.) Sweet

Fl. and Fr.: December - February

Distrib.: Hazaribagh.

LIII. SONCHUS L.

About 50 species, distributed throughout the world (Mabberley, 2008); 5 species, 1 subspecies and 1 variety in India (Karthikeyan et al., 2009); 3 species in Jharkhand.

Key to the species

1a	Perennial herbs, rhizomatous	<i>S. brachyotus</i>
1b	Annual herbs, non-rhizomatous	2
2a	Stem slightly angular and finely grooved	<i>S. oleraceus</i>
2b	Stem cylindrical and not grooved	<i>S. asper</i>

106. *S. asper* (L.) Hill

Fl. and Fr.: April - September. *Distrib.*: Hazaribagh, Koderma.

107. *S. brachyotus* DC.

Fl. and Fr.: March - November.

Distrib.: Palamau, Gumla.

108. *S. oleraceus* L.

Fl. and Fr.: March - November.

Distrib.: Palamau.

LIV. SPHAERANTHUS L.

Forty species distributed to old World tropics to Iran and Egypt (Mabberly, 2008); 4 species

in India (Karthikeyan et al., 2009); 2 species in Jharkhand.

Key to the species

1a	Leaves double-dentate with stalked glands	<i>S. indicus</i>
1b	Leaves single-dentate with sessile glands	<i>S. senegalensis</i>

109. *S. indicus* L.

Distrib.: Throughout the state.

Fl. and Fr.: January - April. Distrib.: Throughout the state.

LVII. TRICHOLEPISDC.

Eighteen species, Central Asia to India (Mabberly, 2008); 13 species in India (Karthikeyan et al., 2009); 1 species in Jharkhand.

110. *S. senegalensis* DC.

Fl. and Fr.: January - April. Distrib.: Bihar

113. *T. stictophyllum* C.B. Clarke

Fl. and Fr.: April - July. Distrib.: Palamau.

LV. SPHAEROMORPHAEA DC.

One species in Australia (Mabberly, 2008); 1 species in India (Karthikeyan et al., 2009); 1 species in Jharkhand.

LVIII. TRIDAX L.

About 26 species distributed in America (Mabberly, 2008); 1 species in India (Karthikeyan et al., 2009); 1 species in Jharkhand.

111. *S. australis* (Less.) Kitam.

Fl. and Fr.: April - May.

Distrib.: Giridih, Hazaribagh.

114. *T. procumbens* L.

Fl. and Fr.: July - February.

Distrib.: Throughout the state.

LVI. SYNEDRELLA Gaertn.

One species, native of tropical America (Mabberly, 2008); 1 species in India (Karthikeyan et al., 2009); 1 species in Jharkhand.

LIX. VERNONIA Schreb.

About 1000 species, distributed in tropical and mostly American (Mabberly, 2008); 54 species, 1 subspecies and 7 varieties in India (Karthikeyan et al., 2009); 8 species in Jharkhand.

112. *S. nodiflora* (L.) Gaertn.

Fl. and Fr.: September - December.

Key to the species

1a	Achenes 3-5 angled and 3-5-ribbed	<i>V. patula</i>
1b	Achenes terete or rarely 3-5 angled but always 6-10-ribbed	2
2a	Outer phyllaries foliose	<i>V. anthelmintica</i>
2b	Outer phyllaries not foliose	3
3a	Leaves white-tomentose or densely villous beneath	<i>V. albicans</i>
3b	Leaves glabrous, glabrescent or sparsely pubescent beneath	4
4a	Stem basally glabrescent	<i>V. aspera</i>
4b	Stem basally pubescent	5
5a	Pappus uniseriate	<i>V. saligna</i>
5b	Pappus biseriate	6
6a	Capitula sessile or subsessile	<i>V. squarrosa</i>
6b	Capitula distinctly peduncled	7
7a	Capitulum with 5-12 florets	<i>V. divergens</i>
7b	Capitulum with 18-30 florets	<i>V. cinerea</i>

115. *V. patula* (Aiton) Merr.

Fl. and Fr.: December - March.

Distrib.: Chota Nagpur.

116. *V. anthelmintica* (L.) Willd.

Fl. and Fr.: September - January. *Distrib.*: Hazaribagh, Lohardaga, Palamau, Singhbhum.

117. *V. albicans* DC.

Fl. and Fr. March - August. *Distrib.*: Gumla.

118. *V. aspera* Buch.-Ham.

Fl. and Fr.: September - January. *Distrib.*: Hazaribagh, Palamau, Ranchi, Santal Pargana.

119. *V. saligna* DC.

Fl. and Fr.: October - December.

Distrib.: Santal Pargana.

120. *V. squarrosa* (D. Don) Less.

Fl. and Fr.: October - January.

Distrib.: Hazaribagh, Lohardaga, Singhbhum.

121. *V. divergens* (DC.) Edgew.

Fl. and Fr.: December - May.

Distrib.: Hazaribagh, Palamau, Ranchi, Gumla.

122. *V. cinerea* (L.) Less.

Fl. and Fr.: Almost throughout the year.

Distrib.: Singhbhum, Chaibasa, Daltonganj, Palamau, Koderma, Gumla.

LX. WEDELIA Jacq.

About 70 species, distributed in tropical and warm temperate regions of the world (Mabberley, 2008); 6 species and 2 varieties in India (Karthikeyan et al., 2009); 3 species and 1 variety in Jharkhand.

Key to the species

1a	Involucral bracts nearly equaling to the disc florets	2
1b	Involucral bracts much longer than the disc florets	3
2a	Climbing shrubs, 1-3 m high	<i>W. biflora</i>
2b	Erect or suberect herbs, 15-60 cm high	<i>W. montana</i> var. <i>wallichii</i>
3a	Leaves sessile, spatulate-lanceolate, margins entire or faintly serrate	<i>W. chinensis</i>
3b	Leaves distinctly petioled, ovate, margins serrate	<i>W. urticaefolia</i>

123. *W. biflora* (L.) DC.

Fl. and Fr.: October - December.

Distrib.: Hazaribagh.

124. *W. chinensis* (L.) Merr.

Fl. and Fr.: March - September.

Distrib.: Hazaribagh.

125. *W. montana* (Blume) Boerl. var. *wallichii* (Less.) H. Koyama

Fl. and Fr.: October-December.

Distrib.: Hazaribagh.

126. *W. urticaefolia* DC.

Fl. and Fr.: Throughout the year.

Distrib.: Throughout the state.

LXI. XANTHIUM L.

Three species in world, cosmopolitan (Mabberly, 2008); 3 species in India (Karthikeyan

et al., 2009); 1 species in Jharkhand.

127. *X. strumarium* L.

Fl. and Fr.: March - December.

Distrib.: Throughout the state.

LXII. YOUNGIA Cass.

About 35 species, distributed in Himalayan region eastwards to Japan from tropical to alpine regions (Mabberley, 2008); 12 species and 2 subspecies in India (Karthikeyan et al., 2009); 1 species in Jharkhand.

128. *Y. japonica* (L.) DC.

Fl. and Fr.: October - April. *Distrib.*: Giridih, Hazaribagh, Palamau, Singhbhum.

At global level the family Asteraceae is represented by c. 1590 genera and 23,600 species, distributed in temperate and subtropical zones

(Mabberley, 2008). It is the fourth largest family of India with 950 species under 167 genera (Arisdason and Lakshminarasimhan, 2017). In present communication, 128 taxa (123 species and 05 varieties) under 62 genera for the state Jharkhand have been enumerated. Members of Asteraceae are very common in neighboring states e.g. West Bengal has 239 species, 02 subspecies and 10 varieties are under 108 genera (Ranjan et al., 2016), Uttar Pradesh has 152 species and 05 varieties are under 88 genera (Khanna, 2017), Odisha has 102 species and 53 genera (Saxsena and Brahmam, 1995) and Bihar has 84 species and 4 varieties are under 54 genera (Kumar et al., 2019).

The study indicates that the Asteraceae are much diversified in the state, out of 62 genera, a total of 37 are represented by only one species and 5 are represented by 5 or more species. The most diversified genus is *Blumea* with 14 species, followed by *Vernonia* (09 species), *Gnaphalium* (07 species), *Conyza* (06 species) and *Launaea* (05 species). A total of ten species are occurs throughout the state, i.e. *Acmella oleracea*, *Ageratum conyzoides*, *Caesulia axillaris*, *Eclipta prostrata*, *Sigesbeckia orientalis*, *Sphaeranthus indicus*, *Synedrella nodiflora*, *Tridax procumbens*, *Wedelia urticaefolia* and *Xanthium strumarium*. On the other hand, distributions of 43 species are restricted to only one district of Jharkhand state.

Out of 128 taxa, c. 82 species flowered in winter season and c. 35 species in summer (Fig. 1). Most of the Asteraceae species follows similar flowering phenology. It may due to the optimization of pollination and seed dispersal (Torres and Galetto, 2011). It has been observed that in Jharkhand all members of family Asteraceae are herbaceous except three shrubby taxa i.e. *Artemisia japonica* Thumb., *Eupatorium mairei* H. Lev. var. *heterophyllum* (DC.) Karthik. and Moorthy and *Vernonia divergens* (DC.) Edgew.

Mabberley (2008, 2017) reported the distribution of Genus *Caesulia* Roxb. with the species *Caesulia axillaris* Roxb. innorth-eastern India only but this species is widely distributed in Indian subcontinent, like Pakistan, Nepal, Bangladesh and Myanmar (Pant, 1995). Hence,

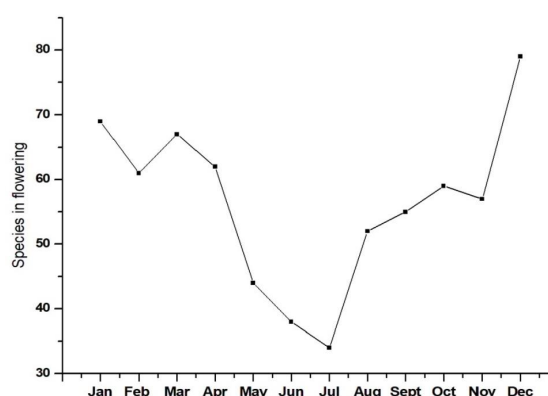


Fig. 1. Flowering phenology of the taxa

there is a conflict on distribution of the genus and need an extensive assessment. However, we have noticed that this genus is distributed almost throughout in plains, paddy fields, shallow ditches and moist low lying areas of India.

Blumeopsis, *Caesulia* and *Sphaeromorphaea* are monotypic genera documented in present study. The representative species of respective genus is distributed in the state, e.g. *Blumeopsis flava* has been recorded in Chota Nagpur, Santal Pargana, *Caesulia axillaris* is occurs throughout in the state and *Sphaeromorphaea australis* was reported from Giridih and Hazaribagh districts.

The distribution of genera of family Asteraceae of Jharkhand at global and national level were studied and compiled. It will help us to know the status of the associated genera in the world and India. On the basis of species diversity, genus *Eupatorium* has the maximum number of species at global level, comprises c. 1200 species in World, 12 taxa in India and 03 taxa in Jharkhand, it was followed by *Senecio* (c. 1000 species in World, 43 in India and 03 in Jharkhand), *Vernonia* (c. 1000 species in World, 62 taxon in India and 09 species in Jharkhand), *Saussurea* (c. 403 species in World, 76 taxon in India and 01 species in Jharkhand), *Artemisia* (c. 400 species in World, 68 taxa in India and 04 species in Jharkhand) etc. Eight genera (*Bidens*, *Chrysanthellum*, *Erigeron*, *Gnaphalium*, *Lactuca*, *Senecio*, *Sonchus* and *Xanthium*) are distributed throughout the world/cosmopolitan while other genera have restricted distribution.

The cultivated species like, *Calendula officinalis* L., *Chrysanthemum coronarium* L., *Chrysanthemum indicum* L., *Cichorium endivia* L., *Cosmos bipinnatus* Cav., *Cynara scolymus* L., *Eupatorium foeniculaceum* Willd., *Glebionis coronaria* (L.) Cass. ex Spach, *Gynura aurantiaca* (Blume) DC., *Helianthus annuus* L., *H. argophyllus* Torr. and Gray, *Lactuca sativa* L., *Tegetes erecta* L., *Tithonia diversifolia* (Hemsl.) A. Gray, *Vernonia elaeagnifolia* DC. and *Zinnia violacea* Cav. are not included in the present communication.

CONCLUSION

A total of 130 taxa belongs to the family Asteraceae are documented. Furthermore, distributions at global and national level of associated genera have been provided. This data will be ready references to assess the Asteraceae diversity in the state of Jharkhand. The study will facilitate strategies for management of wild plants and habitat conservation aspects in terms of plant diversity and resource management.

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REFERENCES

- Anderson, T. 1863. On the Flora of Bihar and the mountains of Parasnath with a list of species collected by Messrs Hooker, Edgeworth, Thomson and Anderson. *J. Asiat. Soc. Bengal.* **32**:187-218.
- Ara, J. 1966. Hazaribagh National (Bihar) Revisited. *J. Bombay Nat. Hist. Soc.* **63**:123-138.
- Ara, J. 1960. A cursory ecological survey of Flora and Fauna of Hazaribagh National Park (Bihar). *J. Bombay Nat. Hist. Soc.* **5**: 326-338.
- Arisdason, W. and Lakshminarasimhan, P. 2017. Status of Plant Diversity in India: an Overview. ENVIS Centre on Floral Diversity. http://www.bsienviis.nic.in/Database/Status_of_Plant_Diversity_in_India_17566.aspx. Accessed on 27.03.2019.
- Bhujel, K.B., Maskey, R., Ambika, P., Gautam and Mandal, R.A. 2017. Effect of Climatic variables on fire incidence and burnt area in tropical forests in Nepal. *e-planet* **15** (1): 21-28.
- Biswas, D.K. and Maheshwari, J.K. 1980. A contribution to the vegetation of Chaibasa, Singhbhum District in South Bihar. *Bull. Bot. Soc. Bengal* **25**:43-51.
- Bressers, J.1951. *Botany of Ranchi District*. Catholic Press, Ranchi.
- Champion, H.G. and Seth, S.K. 1968. *A revised forest types of India*. Govt. of India Publications, New Delhi.
- Clarke, C.B. 1884. Notes on the Flora of Parasnath, N.W. Bengal. *J. Linn. Soc., Bot.* **21**:252-255
- Haines, H.H. 1910. *A Forest flora of Chotanagpur including Gangpur and the Santal Parganahs - A description of all the indigenous trees, shrubs and climbers, the principal economic herbs, and most common cultivated trees and shrubs (with introduction and glossary)*. Superintendent Govt. Printing, Calcutta.
- Haines, H.H. 1921 - 1925. *The Botany of Bihar and Odisha: An account of all the known indigenous plants of the province and of the most important or most commonly cultivated exotic ones with maps and introduction*. 6 parts: 1 (1925), 2 (1921), 3 (1922), 4 (1922), 5 (1925) and 6 (1925). London, Govt. of Bihar and Odisha. (Repr. BSI, Calcutta, 1961).
- Kanodia, K.C. and Malick, K.C. 1966. New Plant Records and critical notes on some plants from South Bihar. *Indian Forest.* **92**:707 - 708.
- Karthikeyan, S., Sanjappa, M. and Moorthy, S. 2009. *Flowering plants of India* (dicotyledons), Vol. 1. Botanical Survey of India, Kolkata.
- Khanna K.K. 2017. Angiospermic plants of Uttar Pradesh-A checklist. *Geophytology* **47** (1): 69-110.
- Kumar, A., Sachan. S., Ghoshal PP and Bharati, K.A. 2020. Checklist and Key to the Asteraceae of Bihar, India. *Int. J. of Adv. Res. Biol. Sci.* **7**(4):1-20.
- Mabberley, DJ. 2008. *Mabberley's plant book*. Cambridge University Press, UK.
- Mabberley, DJ. 2017. *Mabberley's plant book*. Cambridge University Press, UK.
- Majumdar, N.C. and Biswas, S.N. 1979. A Bibliography of the Botany of Bihar. *The Botanique* **10**(1- 4). (Issued in July, 1982).
- Meher-Homji, V.M. 1971. A sketch of the vegetation of the Chotanagpur Plateau and its environs. *J. Indian*

- Bot. Soc.* **50**:162-174.
- Mishra, K.K. 1985. New plant record from Bihar. *J. Econ. Taxon. Bot.* **6**:410-412.
- Misra, R.C., Pani, D.R., Kumar, P. and Das, P. 2018. Vegetation mapping and management strategy of mangroves of Bhitarkanika wildlife sanctuary, Odisha: A remote sensing approach. *e-planet* **16** (2): 89-101.
- Mooney, H.F. 1941. Some additions to the Botany of Bihar and Orissa. *Indian For. Rec.* **3**:63-119.
- Mooney, H.F. 1944. A list of plants recorded from the parts of Ranchi and Palamau district and the States of Jashpur and Surguja. *J. Roy. Asiat. Soc. Bengal* **10**: 59-118.
- Mooney, H.F. 1950. *Supplement to the Botany of Bihar and Orissa*. Catholic Press, Ranchi.
- Mukerjee, S.K. 1947. A. Botanical tour in Chotanagpur. *Bull. Bot. Soc. Bengal* **1**:27-28.
- Mukerjee, S.K. 1956. Some new records of plants from Parasnath hills. *J. Indian Bot. Soc.* **35**: 245-247.
- Panigrahi, G.A. 1966. Botanical tour in the Rajmahal hills of Bihar. *Bull. Bot. Surv. India* **8**: 1-15.
- Pant, P.C. 1995. Asteraceae (subtribe Angiantheae DC.)- Flora of India (eds. Hajra et al.), vol. 13, Botanical Survey of India, Kolkata.
- Paria, N.D and Chattopadhyaya, S.P. 2000. *Flora of Hazaribagh District, Bihar*. Vol. I. Botanical Survey of India, Calcutta.
- Paria, N.D and Chattopadhyaya, S.P. 2005. *Flora of Hazaribagh District, Bihar*. Vol. II. Botanical Survey of India, Calcutta.
- Paul, S.R. 1984. Vegetation types of Netarhat Bihar. *J. Econ. Taxon. Bot.* **5**:65-74.
- Paul, S.R. 1990. New Plants from Netarhat Plateau, Bihar - II. *Geophytology* **20**:21-23.
- Paul, S.R. and Prasad, S.S. 1978. New Plant records for Bihar from Netarhat Plateau - 3. *Proc. Natl. Acad. Sci. India, B* **48**: 93-98.
- Paul, S.R. 1976. New Plant Record for Bihar from Netarhat Plateau - 1. *The Botanique* **7**:29-32.
- Paul, S.R. 1978. New Plant Records for Bihar from Netarhat Plateau - 5. *Bot. Reg.* **1**:16-19.
- Raizada, G. 1978. Some interesting plants from Bihar. *Indian J. Forestry* **1**:61-155.
- Ranjan, V, Lakshminarasimhan, Dash, S.S. and Chowdhery, H.J. 2016. *Flora of West Bengal*, Vol. 3. Botanical Survey of India, Kolkata,
- Ranjan, V. 2014. *Flora of the Parasnath Wildlife Sanctuary Jharkhand*. Bishen Singh Mahendra Pal Singh, Dehradun.
- Sanyal, A. 1957. Additional notes on the Botany of Bihar and Orissa by H.H. Haines and its supplement by Dr. H.F. Mooney. *Indian Forest.* **83**:230-235.
- Sarma, T.K. and Sarkar, A.K. 2002. *Flora of Palamau District, Jharkhand*. Botanical Survey of India, Calcutta.
- Saxena, H.O. and Brahmam, M. 1995. The flora of Orissa, Vol. 2. Odisha Forest Department corporation Limited, Bhubneshwar.
- Shukla, A. , Gaurab, K. and Shukla, N. 2022. Factors influencing marketing of non-timber forest produce: A study in Jharkhand state, India. *e-planet* **20** (2): 159-165.
- Singh, N.P., Mudgal, V., Khanna, K.K., Srivastava, S.C., Sahoo, A.K., Bandopadhyay, S., Aziz, N., Das, M., Bhattacharya, R.P. and Hajra, P.K. 2001. *Flora of Bihar Analysis*. Botanical Survey of India, Calcutta.
- Torres, C. and Galetto, L., 2011. Flowering phenology of co-occurring Asteraceae: a matter of climate, ecological interactions, plant attributes or of evolutionary relationships among species? *Organisms Diversity Evol.*, **11**(1): 9-19.