

Controversial Herbal Raw Drugs (Substitutes, Equivalents, Adulterants)

Authenticity of the herbal raw drugs used in preparation of herbal health care and wellness products is presently the major concern of the growing herbal sector in the country. Whereas some substitutes (*Withania somnifera* in place of *Lilium polyphyllum* as 'Kakoli,') and geographic equivalents (*Pluchea lanceolata* in north India and *Alpinia galanga* in south India as 'Rasna') are officially recognised, there are a number of herbal raw drugs which are freely traded and used as equivalents and many others that fall in the category of adulterants. Some of the commonly used equivalents noted during the survey include different species of *Berberis* as 'Daruharidra', different species of *Tribulus* as 'Gokshura', and use of different species like *Holostemma ada-kodien*, *Flickingeria mackraei* and *Leptadenia reticulata* as 'Jivanti'. A major proportion of the adulteration seems to be due to inexperience of wild gatherers who make the collection of similar looking plants at the time of collection. It becomes difficult to separate the adulterated material once it is dried and aggregated. Some cases of adulteration due to similarity of names have also been noted during the survey (viz. trade of flowers of *Rhododendron arboreum* in place of flowers of *Hibiscus rosa-sinensis*, known as 'Gularh phool' and 'Gurhal phool' respectively). Some cases of seemingly deliberate mixing of similar looking herbal raw material were also noted (viz. mixing of fruiting spikes of different *Piper* species with Pippali). The issue, if not addressed soon, can have serious implications on the further growth of the sector.

9.1. THE ISSUE

Authenticity of the herbal material forms the very foundation on which the trust about the use of herbals for health care, food and cosmeceuticals is based. The days when the herbal healer would himself collect the material from the wild to prepare his own formulations have long given way to the practitioner making prescriptions of the commercially produced herbal formulations requiring bulk supplies of raw material got collected from various parts of the country. The onus of making authentic collections and keeping trust has thus shifted from the one intimately knowledgeable about the plants to a large body of wild gatherers who are guided by economic interests and who are not necessarily proficient in plant identification. The impact of this shift of onus is visible in respect of many wild collected herbal raw drugs in trade where the supposedly authentic raw drug is a mixture of material pertaining to more than one plant species. There is also a growing practice of using replacement herbal raw drugs, especially in cases where the authentic herbal raw drug is not available in required quantities.

These practices where material obtained from different species is traded as single herbal raw drug make the concerned herbal raw drug controversial. The fact that the 'sandigdha dravays', as the controversial herbal raw drugs are called, are in active trade itself is a pointer towards their commercial use. In a study, it was noticed that 11.5% of herbal raw drug samples collected from the market were spurious (*Dr. H. B. Singh, Chief Scientist NISCAIR (Retd.) – per. comm. during National Workshop of Stakeholders of Medicinal and Aromatic Plants, held at Delhi on 28 May 2015*). The major problem is with the material that is collected from the wild with most of the organised wild collection happening based on the local names of the plants and not on their botanical identity.

The sector that already is being called upon to verify its efficacy on standard modern parameters, the issue of using controversial herbal raw drugs is likely to have serious implications on the growth of the sector. The issue needs to be urgently addressed.

9.2. SUBSTITUTES, EQUIVALENTS AND ADULTERANTS

The category of the controversial raw drugs varies from the recognised 'substitutes', to plants freely used as 'equivalents', and to the plants qualifying as 'adulterants'.

9.2.1. Substitutes

In many cases, where the original herbal raw drug is not available due to population reduction or due to geographical considerations, the use of 'pratinidhi dravaya' or the 'substitute' is allowed and in such cases the plant source of the original herbal raw drug and the one that is used as substitute are well known. As an example, 'ashwagandha' (*Withania somnifera*) is recognised as a substitute in place of 'kshir kakoli' (*Lilium polyphyllum*), a Himalayan herb no more available in commercial quantities. The plant sources of both these herbal entities are clearly known. Identification, recognition and validation of 'substitute' herbal raw drugs



Lilium polyphyllum
(Kshir Kakoli)

Roscoeae purpurea
(Kakoli)

Withania somnifera
(Substitute)

is a long drawn process that is based on assessment of similarity of properties like 'rasa', 'guna', 'virya' and 'vipaka' in both the original and the substitute drug. Thus, substitutes for original herbal raw drug can belong to different plant species in the same family or different families. Treatise by scholars like Bhavaprakasha, Yogaratnakara and Bhaishajya Ratnavali contain detailed description of many 'substitute' drugs.



Aconitum heterophyllum (Atees)
authentic raw drug

Cyperus rotundus (Musta)
substitute

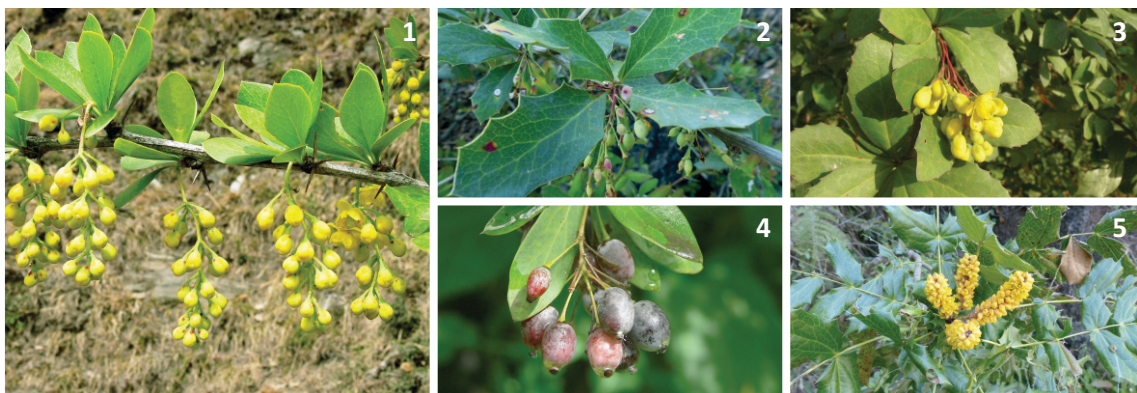
Chaerophyllum villosum (Mithi Patish)
adulterant

The use of accepted 'substitutes' in many cases has become so common that the original raw drug is almost forgotten. For example, the entire 'ashtavarga' group, consisting of underground parts of Himalayan herbs, is substituted by other plant raw drugs viz. 'kakoli' and 'kshirkakoli' by 'ashwagandha' (*Withania somnifera*) and 'riddhi' and 'vridhhi' by 'varahi kand' (*Dioscorea bulbifera*). The use of 'mustaka' (*Cyperus rotundus*) as a substitute of 'ativisha' (*Aconitum heterophyllum*) is also recognised. Some of the other commonly used substitutions are 'jhinghan' (*Lannea coromandelica*) in place of 'murva' (*Marsdenia tenacissima*); 'pippal mool' (*Piper longum*) in place of 'chavya' (*Piper chaba*); 'yavasaka' (*Alhagi pseudalhagi*) in place of 'dhanvayasah' (*Fagonia cretica*); etc. Plant sources of all the above mentioned original herbal raw drugs and the species used as their substitutes are well known.

In the case of 'equivalents' and the 'adulterants', on the other hand, the plant source of the raw drug is usually ambiguous.

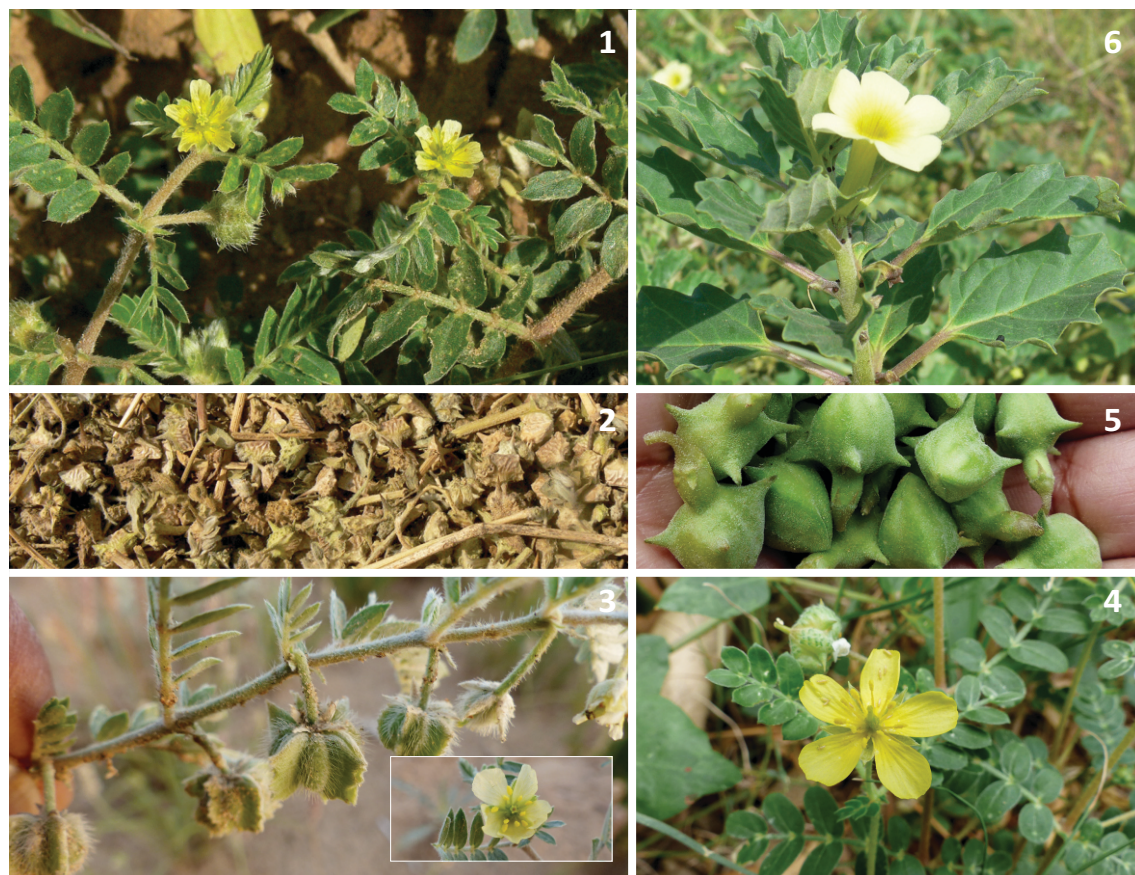
9.2.2. Equivalents

The use of herbal raw drug material considered to be 'equivalent' to the originally accepted herbal raw drug brings in another level of ambiguity to the herbal sector in the country. Many cases of the use of various types of 'equivalents' came to the notice during the present study. The first type of



1. *Barberis aristata*; 2. *B. asiatica*; 3. *B. chitria*; 4. *B. lycium*; 5. *Mahonia* sp.

'equivalents' pertain to the herbal material obtained from similar looking plants of the same or similar genus. For example, the plant drug 'daruhardira' is officially correlated to *Berberis aristata*. However, stem and roots of many other species of *Berberis* growing in the same habitat are also being collected and freely used as 'daruharidra' equivalent.



Various plant species used as 'Gokshura' (1. *Tribulus terrestris*; 2. Fruits of *Tribulus terrestris*; 3. *T. alatus*; 4. *T. lanuginosus*; 5. Fruits of *Pedalium murex* (bara gokhru); 6. *Pedalium murex*)

Similarly, material from different species of genus *Tribulus* is collected and freely used as 'gokshura', even as the officially recognised herbal raw drug must be obtained only from *Tribulus terrestris*.

Another example of use of equivalents taken from different species of the same genus as herbal raw drug is of 'bala' that should be collected only from *Sida rhombifolia*. However, the material collected from other species of *Sida* is also freely used as 'bala'. Herbal raw drug 'bhumi amla' is another example where the herbal material from many herbaceous species of genus *Phyllanthus* is freely collected and used as 'bhumi amla' even as the official source of the raw drug is *Phyllanthus amarus*. Trade of 'Shankpushpi' is another example of use of various equivalents. In all the above cases, it is not possible to segregate the material species-wise after it has been aggregated.

The second type of 'equivalents' pertain to using material obtained from other alternative plants in place of the accepted ayurvedic herbal raw drugs. For example, unrelated species like *Holostemma ada-kodien*, *Flickingeria mackraei* and *Leptadenia reticulata* are used as 'Jivanti' in different parts of the country. Similarly, *Pluchea lanceolata* is used as 'rasna' in north India and *Alpinia galanga*, considered to be geographic equivalent of 'rasna', is used as 'rasna' in southern



Various plant species used as 'Shankpushpi' (1. *Clitoria ternatea*; 2. *Convolvulus prostratus*; 3. *Convolvulus arvensis*; 4. *Evolvulus alsinoides*)

India (Prakash *et al.*, 2013). 'Parpata', widely used in fever and treatment of gastritis, diarrhoea, and excessive thirst, is another herbal raw drug where many 'equivalents' were noted in trade. Some of the raw drugs traded as 'parpata' or 'parpataka' that could be critically correlated with the taxonomic identity of the plants from which these are sourced are *Fumaria indica* and *Fumaria officinalis* (Fumariaceae) *Polycarpaea corymbosa* (Caryophyllaceae), *Oldenlandia corymbosa* (Rubiaceae), and *Mollugo cerviana* (Molluginaceae).

'Chiretta', another important herbal raw drug, is officially correlated to the Himalayan herb *Swertia chirayita* with material obtained from *Swertia cordata* as recognised substitute. However, material obtained from many other species of genus *Swertia* as well as that obtained from allied species like *Helenia elliptica*, and *Enicostemma axillare* is also used as 'Chiretta'. Many a times, material obtained from a tropical herb *Andrographis paniculata*, known in trade as 'kalmegh' or 'tikt-chiretta', is also clubbed with the material obtained from true 'chiretta'. Pant (2005) reports that material from 9 different species of *Swertia* is traded as 'chiretta' in Nepal. Khanal *et al.* (2014) report that material from 12 different species of *Swertia* is traded as 'chiraito' in Nepal and such adulteration is as high as 20%. Government of Nepal has forbidden the wild collection and trade of *Swertia chirayita* from May to September every year. More than 80% of 'chiretta' collected from Nepal is exported to India.

The presence of common medicinal properties in the form of the same or similar active principles in unrelated plants as per interpretations and discussions in one or the other classical texts



Various plant species used as 'Chiretta' (1. *Swertia chirayita*; 2. *S. cordata*; 3. *S. tetragona* 4. *S. ciliata*; 5. *S. paniculata*; 6. *Enicostemma* sp.; 7. *Andrographis paniculata*)

perhaps lends some sanctity to the use of unrelated species as 'equivalents'. For example, plant material obtained from species pertaining to three different genera i.e. *Berberis*, *Mahonia* and *Coscinium* is used as 'daruhardira' as all these plants contain 'berberin' as the major organic

compound. In such cases herbal raw drugs obtained for any of these plant species is used depending upon the geographical availability. It needs, however, to be noted that use of many of these 'equivalents' has not been officially recognised in the Ayurvedic Pharmacopoeia of India.

9.2.3. Adulterants

'Adulterants' is the third and the most worrisome category of controversial herbal raw drugs. The extent of adulteration varies from the unintended mixing of foreign material with the accepted herbal raw drug due to inexperience of wild gatherers who sometimes gather similar looking plants at the time of collection to the deliberate mixing of foreign material or inferior quality material in the accepted herbal raw drug with the intent to make profit. 'Adulteration' also varies from small percentage of foreign material, including non-accepted parts of the same plant, added to the main herbal raw drug to the entire lot being spurious. 'Adulterants' cause debasement of the accepted herbal raw drugs adversely impacting their therapeutic and chemical properties. Irrespective of the intent behind adulteration of the herbal raw drug material, it is very difficult to separate the adulterated material once it is dried and aggregated. Many instances of 'adulterants' were noticed during the current study. One such instance related to market samples with seemingly deliberate mixing of similar looking fruiting spikes of different *Piper* species with Pippali (*Piper longum*).



'Pippali' plant and Authentic Sample of 'Pippali'



Spurious 'Pippali' Samples from the Market

Flowers of *Hibiscus rosa-sinensis*, known as 'Gurhal phool', form an important herbal raw drug used in various classical herbal health care formulations. However, during survey of herbal mandis, it was noticed that the raw drug being usually sold as 'Gurhal phool' was actually the flowers of *Rhododendron arboreum*, a Himalayan tree bearing large scarlet flowers. Retracing the line of supply, it came out that the major supply of the material being sold as 'Gurhal phool' was being obtained from Chamba district in Himachal Pradesh. Further enquiries from the field revealed that the *Rhododendron arboreum* flowers, commonly known as 'Burash phool', are

locally known as 'Gularh phool' in Chamba district in Himachal Pradesh. The mix up, seemingly due to similarity of names, also explains the vast difference in rates of this herbal raw drug in the market.



Hibiscus - fresh and dried flowers

Rhododendron - fresh and dried flowers

Dr. H. B. Singh, Chief Scientist NISCAIR (Retd.), based on his detailed study of market samples, informed about the mixing of the leaves of *Malva rotundifolia*, *Malva pusila*, *Merremia emarginata*, and *Evolvulus nummularis* with those of 'brahmi' (*Centella asiatica*); adulteration of 'rakta punarnava' (*Boerhavia diffusa*) samples with those pertaining to *Trianthema portulacastrum*, and so on. (pers. comm. during National Workshop of Stakeholders of Medicinal and Aromatic Plants, held at Delhi on 28 May 2015). Naitahani and Bisen (2005) had recorded the trade of *Blepharispermum subsessile* as 'rasna' in place of *Pluchea lanceolata*, the accepted source of 'rasna' from Jagdalpur and Dhamtari herbal mandis in Chhattisgarh. Khare (2007) has also reported the trade of *Blepharispermum subsessile* as an 'adulterant' of 'rasna' from herbal mandis in Madhya Pradesh.

Roots of *Murdannia edulis* (= *Aneilema scapiflora*), a common herb of Sal forests, are reported to be collected and traded as 'musli'.

The case of 'asoka chhal' (*Saraca asoka*), used by domestic herbal industry in large quantities every year, continues to baffle, especially as the species has very limited wild populations and no known commercial cultivation. It is suspected that bark of some other tree species, including that of *Polyalthea longifolia*, *Bauhinia variegata*, *Trema orientalis*, and *Shorea robusta* might be used as 'asoka' bark (Dubey and Sawant, 2015).

Supply of 'Ashoka Chhal', bark of *Saraca asoka*, a small indigenous tree of moist tropical regions, to meet annual requirement of about 2000 MT of the domestic herbal industry engaged in making ASU formulations, continues to intrigue. Close monitoring of the wild populations of the species in its range of distribution in Kerala, Karnataka, Maharashtra, Goa and Odisha does not indicate any significant collection from its wild populations. The species is not reported to be under any significant cultivation. It sure raises a suspicion about the authenticity of the material being used as 'Ashoka Chhal'. Thus, the question that 'from where Ashoka Chhal come', raised by Ved and Goraya (2008), is still un-answered.



Ativisa/ Atees

'Atees', the dried tuberous roots of high Himalayan herb *Aconitum heterophyllum*, is an important herbal raw drug and commands a market price ranging from ₹ 3000 to ₹ 4000 per kg. Rhizomes of 'Musta' (*Cyperus rotundus*), a member of the family Cyperaceae, are also in trade as 'ativisa' substitute.



However, material obtained from some other plant species is also traded as 'atees' or 'ativisa' in different markets in the country. For example, survey of Chennai market revealed the trade of the corms of *Cryptocoryne spiralis*, a member of Family Araceae as 'atees' substitute, under the name of 'Atividayam' with a market price of ₹ 200-300 per kg. Also known as 'nattativitayam' in Kerala, the corms of *Cryptocoryne spiralis* are used in place of Ativisha (*Aconitum heterophyllum*) by the domestic herbal industry in southern India. The fact has also been recorded by Anandakumar *et al.* (1982) and Prasad *et al.* (2012). Nair (2004), taking note of this trade, had opined that since *Cryptocoryne spiralis* was an advanced monocot and was taxonomically very distant from *Aconitum heterophyllum*, a primitive dicot, it should be treated as 'adulterant' of the true drug.



Aconitum heterophyllum



Cryptocoryne spiralis



Chaerophyllum villosum

Similarly, in the Delhi market, roots of *Chaerophyllum villosum*, a member of family Apiaceae, were noticed to be sold as another adulterant of 'Atees' under the name 'Mithi-Patish'.

The domestic herbal industry uses very high quantities of (a) 'banslochan' or 'tabashir', the siliceous intermodal exudates of some species of bamboo (*Bambusa arundinacea*, *Melocanna bambusoides*, *Bambusa balcooa*, etc.); (b) 'gandhapura patra taila', the oil extracted from different species of *Gaultheria* (*G. fragrantissima* and *G. procumbens*); and (c) 'kapur', the oil

extracted from *Cinnamomum camphora*. However, no record of harvest of any of these species for extraction of 'banslochan', 'gandhipura patra taila' and 'kapur' respectively could be found during the current study. Similarly, no data of import of these entities in such large volumes also could be tracked. It is suspected that most of the material being used as 'banslochan', 'gandhipura patra taila' and 'kapur' as herbal raw drugs may not be of plant origin. The issue needs to be thoroughly investigated and resolved.

Banslochan/Tabasheer

An estimated 2000 MT of Banslochan or Tabashir is used annually by the herbal industry in India making Ayurvedic, Siddha and Unani formulations. True 'banslochan' or 'tabasheer' is a translucent whitish substance (sometimes with bluish tint that is considered to be of superior quality) composed mainly of silica and water with traces of lime and potash, collected from the nodal joints of various bamboo species viz. *Bambusa bambos*, *Bambusa balcooa*, *Melocanna bambusoides*, etc. However, neither any record of wild collection of 'banslochan' in the country is available nor such collection has come to the notice during extensive field surveys during the course of this study. Similarly, analysis of foreign trade data does not show any record of import of such large quantities of 'banslochan'. Huge quantities of 'banslochan', nevertheless, continues to be traded in the market under various names like 'banslochan asli', 'vanshlochan singapuri', 'banslochan desi', 'tawasheer', 'bamboo-manna', etc. with different varieties commanding highly variable prices ranging from less than ₹ 100 per kg to more than ₹ 10,000 per kg.



Different grades of 'banslochan' recorded in Trade

Informal interactions with traders and experts reveal that most of the material sold as 'banslochan' may not be a plant product at all. The issue needs investigation and early resolution

9.3. DISCUSSION

The increasing use of 'sandigdha dravays' or controversial herbal raw drugs has become a cause of serious concern.

A major part of the problem is due to the use of local names at different stages of the movement of herbal material from primary production sites to the end users. The local names vary from region to region adding complexity to the issue. For example, 'guduchi' (*Tinospora cordifolia*), a very common ayurvedic herbal raw drug, is known as 'amrutha', 'giloe', 'gulje' and 'amritahballi' in different parts of the country. 'Ratanjot' is known to be obtained from *Arnebia benthami*, a Himalayan herb. However, in Rajasthan the produce from *Jatropha curcus* is also known as 'ratanjot' with no similarity with the original produce.

The use of local names also creates confusion about the true botanical identity of the herbal raw drug material in trade and use. For example, *Holostema ada-kodien* is a climber found in the southern western ghats of India. During the current study, large quantities of this species were recorded to be in trade as 'jivanti' in one of the herbal raw drug mandis in northern India. Close scrutiny of the material revealed that the material in trade in this particular mandi was not *Holostemma ada-kodien* but *Flickingeria mackraei*, also a candidate for 'jivanti'. It was due to correlation of 'jivanti' with *Holostemma ada-kodien* in some of the texts that the traders had named the material in trade actually pertaining to *Flickingeria mackraei* as *Holostemma ada-kodien*. This type of wrong correlation of herbal raw drugs in trade is very common and adds to the complexity of the entire herbal raw drug sector.

The possible solution to the problem lies in the following:

- (a) All trade and use of herbal raw drugs should be under their standard binomial botanical nomenclature. As at present, the traders tend to rely upon various available publications on medicinal plants, Indian and foreign, many a times correlating entities derived from Indian plant species to some European and other foreign species. It would be highly desirable to publish an authentic illustrated '**Compendium of Traded Medicinal Plants in India**' for the benefit of all stakeholders involved with medicinal plants. The compendium, in addition to description of plants and updated botanical nomenclature, should include authentic references to local names, trade names, API names, etc. and also photographs of important herbal raw drugs and their plant sources. Publication of such compendium will be an arduous work needing intensive table work and extensive field visits to various parts of the country and may need 2-3 years for completion. NMPB should take up this challenge and identify appropriate agency for this work.
- (b) Herbal raw drugs in trade and use must have a tag of backward linkages in the form of Chain of Custody along the supply chain from the level of primary production to various nodes along value chain to arrive at the identity of the raw drug in case of doubt.
- (c) The API needs to be updated to include the traditionally used equivalents/ substitutes.

A very urgent action to address the issue of controversial herbal raw drugs is warranted.