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Intensity and depth of traditional knowledge of two medicinally important plants- *Thevetia peruviana* and *Calotropis procera* presently conserved in rural areas of Haryana

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Abstract
Medicinal plants are being explored and screened constantly for their efficacious therapeutic use. Present survey was aimed to identify the target community in our society which is consistent carrier of traditional knowledge. Field survey was undertaken to study diffusion pattern of traditional knowledge. On the basis of allocated scores, PCTK (Persons Carrying Traditional Knowledge) strength was evaluated. An alarming decline in ethnomedicinal knowledge in respect of the number of uses and PCTK % score was observed. *Calotropis procera* plant showed higher PCTK score strength as compared to *Thevetia peruviana* in all the three districts i.e. Rohtak, Jind and Karnal of Haryana, India. Of the total population surveyed in the three select districts, maximum conservation and diffusion of traditional knowledge was found in Karnal district in case of *Calotropis procera* and Jind District in *Thevetia peruviana*. Male and female knowledge carriers and users showed varied and webbed pattern of traditional knowledge transmission in all the three districts. To compile the scattered and undocumented traditional knowledge, authors propose to set up an IPCTKW (Integrated Persons Carrying Traditional Knowledge) system with the help of which various plant protection and utilization strategies can be planned.

Keywords: Traditional knowledge, Ethnobotanical, Ethnomedicinal, *Calotropis procera*, *Thevetia peruviana*, IPCTKW, PCTK.

Introduction
In India, a vast pool of traditional knowledge with respect to medicinal properties of native plants is available amongst rural people. This whole set of information is lying scattered in bits and segments (especially in rural India) without any organization. No policy exists whereby this information can be retrieved, compiled and utilized. In India, a wide spectrum of biodiversity exists and plants are integrated with our cultural heritage through cultural beliefs, rituals and festivals and as special offerings to Gods and ancestors [1]. Presently, the traditional knowledge of indigenous people is severely endangered as younger generation is no longer interested to acquire and transmit it further. Traditional knowledge of medicinal plants is conserved and transmitted via two modes i.e. documented knowledge including recently compiled TKDL(Traditional Knowledge Digital Library) in India and scattered segmented knowledge (uncompiled and undocumented) which is disbursed randomly in society amongst rural and urban people. Traditional knowledge forms the direct basis of scientific exploration and many new drugs have been developed from it. In present era, traditional knowledge is being ignored by younger generation and facing a threat of extinction. Traditional knowledge is fast disappearing and the younger generation is not showing interest in its protection [2]. Extensive work has been done on traditional knowledge [3, 4], yet voluminous traditional knowledge is lying scattered in patches worldwide. This recklessly draining out traditional knowledge needs to be channelized. There should be a very strong and supportive network to integrate all this information. Therefore, Integrated Persons Carrying Traditional Knowledge Web System (IPCTKW system) needs to be created for an easy identification and screening of potent plants having useful medicinal properties. During ancient times, people used to rely on the local plant (s) resources for both short term and long term treatment of ailments. According to a recent estimate, large population of the world i.e. about 70-80% depends on traditional medicinal plants to meet their demands [5]. Most of the population in Sikkim depends on more than one type of health care systems depending on the types of ailments and medicine available and cost preference while the majority of the population does not have a choice of

allopathic medicine, due to side effects, unavaialability and high cost [6]. In advanced world today, interest is shifting towards allopathy and other modern medicare options. A major part of diseases could not be treated well because of many shortcomings like safety and tolerability issues, inconvenience of medicinal dose [7]. As the world population is growing enormously and synthetic drugs are proving harmful in inducing drug resistance and adverse drug reactions, etc. therefore, there is a dire need to explore, conserve and practice our ethnobotanical knowledge. This knowledge can be used to sustain and benefit the community at large. In the next two decades when human population on this planet will explode, then the available medicare options will not be sufficient to treat every human being. Then in addition to allopathy, phytopharmaceuticals will also have to be opted along as one of the prime choices. Then in response to fast changing global trading policies, our national resources will emerge as unfathomable biowealth and help define our future national economy. It is necessary to put more efforts in the documentation of such knowledge before it get vanished [8].

The present survey is an effort on the part of authors to study diffusion pattern and trends with respect to traditional knowledge collected for two economically important medicinal plants i.e. *Thevetia peruviana* (KUK/BOT/IPS-19) *Calotropis procera* (KUK/BOT/IPS-21) from indigenous people of 12 villages of 3 districts of Haryana, India. The two plants are quite different in their morphology, growing habits, mode of cultivation and medicinal uses etc. *Calotropis* plant is very popular and socially integrated since ancient times as its uses have been documented in Charaka Samhita and other age old medicinal books. Different medicinal properties of *Calotropis procera* have been studied by various workers [4, 9-13]. The extracts of different parts of *Calotropis procera* have significant therapeutic value [14].

Thevetia peruviana, on the other hand, is comparatively a new plant to Indian culture and conditions. The plant is recorded to be more than 2000 years in its native countries- West Indies, Brazil and Mexico. It was taken to Europe about three hundred years ago, and from there finally to India and today it has naturalized in virtually all countries in the tropical region [15]. It became more visible and its popularity was highlighted when National Highways were beautified with their extensive plantation. In urban areas it is grown as ornamental plant and hence it is important horticultural plant. But frequency of cultivation of this plant is sporadic in rural areas. Many attempts have earlier been made to study different medicinal properties of *Thevetia peruviana* [16-22].

During present survey ethnomedicinal knowledge disbursed amongst remote rural people of Haryana was gathered. Selected site was never explored previously for person to person contact collection of TK. Remote rural locations are assumed to be conserve houses of TK [23, 24]. Ethnomedicinal methods can show how different ethnic groups living within the same geographic landscape interact with environmental resources [25, 26]. A comparative study of two select plants on the basis of PCTK (Persons Carrying Traditional Knowledge) score strength helped study pattern and trends of diffusion of traditional knowledge along with denudation threats. PCTK score is proposed by the authors for the first time to identify the plants facing threat of losing ethnomedicinal significance due to various reasons. Such a methodical screening will help prepare an IPCTKW (Integrated Persons Carrying Traditional Knowledge Web) for future conservation plans. IPCTKW can serve as an important tool to collect information for various medicinal uses of plants and in accordance to use them for drug development and protection of threatened plants as well. Highly unexpected results emerged out of the present study which point out to set newer challenges and strategies for true conservation and use of TK as an alternative medication method for masses.

Materials and methods

Ethnomedicinal significance/usage of a plant is dependent on the demographic features, socio-cultural profile and availability/non–availability of the plant. During present study of three districts of Haryana the demographic features considered are listed in Table 1.

Table 1: Showing demographic profile of the three districts of Haryana, India

District	Jind	Rohtak	Karnal
Geographic Location	29.32°N 76.32°E	28.54°N 76.34°E	29.68°N 76.98°E
Male Population	712,254	566,708	798,840
Female Population	619,788	491,975	707,483
Sex Ratio (Females Per Thousand Males)	870	868	886
Literacy Rate (%)	72.70	80.40	76.40
Male Literacy Rate (%)	82.50	88.40	83.70
Female Literacy Rate (%)	61.60	71.20	68.30

Source: www.census2011.co.in, Population Census India

Reasons for selecting the site

The villages/ sites selected in present study were not in touch with urbanization and can be considered as remote rural areas (referred to Table 1 for geographic location). In common only tribal people are considered as a rich information source of TK but rural unurbanized people are rarely considered as TK informants. The reason for selecting 12 remote villages of Haryana (India) was to strengthen the latter view.

Table 2: Showing the socio economic profile of the village

Sr. No.	Name of the District	Name of the Village	Name of the Sarpanch	Distance from main District (km)	Population	Literacy Rate (%)	Health Facilities
1	Jind	Fatehgarh	Mr. Shri Niwas	32	3500	40	Not satisfactory
2	Jind	Lijwana Kalan	Mr. Ram Mehar Singh	32	16,000	70	Yes, But Inadequate or not Satisfactory
3	Jind	Karsola	Mr. Ramphal	28	9,000	60	Yes but not Satisfactory
4	Jind	Lijwana Khurd	Mr. Vidhyadhar	30	5,000	70	Yes but not Satisfactory
5	Rohtak	Farmana Badshahpur	Mrs. Saroj	35	5,000	70	Satisfactory
6	Rohtak	Saman	Mrs. Raj Bala	38	9,000	60	Yes but not Satisfactory
7	Rohtak	Bedwa	Mr. Rajmal	40	1,000	50	Yes but not Satisfactory
8	Rohtak	Farmana Khas	Mr. Jagdish	37	20,000	70	Satisfactory

9.	Karnal	Kairwali	Mrs. Rani	16	2,800	60	Not satisfactory
10	Karnal	Kalram	Mr. Shekhar	23	8,000	75	Satisfactory
11	Karnal	Chora Majra	Mr. Rajinder Khurana	26	2,500	60	Satisfactory
12	Karnal	Arainpura	Mr. Ajay Singh	22	12,000	80	Yes but not Satisfactory

* Areas where civil hospitals are either not available or not in close vicinity are considered as areas with inadequate/not satisfactory health facilities.

Ethnographic profile of the selected plants

Calotropis procera is an ethnographically popular plant as compared to *Thevetia peruviana* which had no ethnographic footing in all the surveyed sites except for sporadic usage. Both the plants have also been placed in poisonous/ toxic category and that is why people are fearful for their direct usage.

In present study people who carried traditional knowledge were primary sources as subjects instead of objects. In order to derive benefit from our scattered traditional knowledge in varied classes and strata of society, various steps were followed. First of all sampling sites were identified and their credentials were identified through village Sarpanch (Elected head of the village). With the help of the guidance of the concerned Sarpanch, the socio-economic status of the villages was studied and data was collected. Table 2 shows the socio economic profile of the each surveyed village. The health facilities/services available in the village were visited and considered for interpretation of results. The data was then collected according to the designed Proforma. The information was collected after showing dried voucher specimens, fresh plants and plant photographs. Some of the informants could provide information in vernacular regional Haryanvi language only and with the help of an interpreter/translator, the information was discretely obtained. The native data was then organized and analyzed by plotting line graphs and tables etc.

Selection of sampling sites

It is a general perception that traditional knowledge is practiced and conserved amongst rural people as compared to urban people who can avail modern healthcare facilities. Selection of sites and sampling was done randomly and three districts of Haryana state in India were selected i.e. Jind, Karnal and Rohtak for the field survey. From each district, four villages selected are as under.

Jind: Lijwana, Lijwana Kalan, Karsola, Fatehgarh

Rohtak: Farmana Khas, Farmana Badshahpur, Saman, Bedwa

Karnal: Kalram, Kairwali, Chora Majra, Arainpura

Design of format

In order to compile or gather our scattered traditional knowledge in varied classes and strata of society, a well structured format was designed in the laboratory. Utmost care was taken during design of Proforma. The format was designed so as to provide complete information about the select village and also about the plants for which field survey has been carried out.

The format consisted of two parts. Part 1 dealt with the socioeconomic profile of the informant providing knowledge about the plant and Part 2 of the format provided the primary data about the usefulness of plant and the extent of diffusion of TK. It also provided the detailed knowledge of the plant i.e. whether it is used as crude drug or after formulation development along with its side effects and uses etc. The format provided complete information about the plant and the study site.

Variables and scoring patterns

Scores were allotted to different attributes on the basis of their significance and contribution e.g. people having complete knowledge about the plant were assigned with 20 grade scores and 10 grade scores were allotted for incomplete information. Authentic information was allotted 20 grade scores and for vague information, no scores were allotted. For high extent of diffusion, 20 grade scores were granted, for moderate 10 and no scores were awarded for low diffusion.

Analysis and interpretation of data

On the basis of scores allotted to informants, line graphs and pie diagrams were plotted and percentage of traditional knowledge carriers and users was calculated and tabulated in Tables 3, 4 & 5. The pattern of diffusion of traditional knowledge was studied in all the three districts in order of preference (Table 6). PCTK score strength for both the plants was compiled in Tables 7 & 8. In order to calculate the PCTK score strength, randomly procured data was allotted scores and organized. Maximum and minimum scores were obtained on the basis of their maximum or minimal reported usage.

Results and Discussion

A field survey to work out the diffusion pattern and trend of traditional knowledge of 12 villages of 3 districts of Haryana was undertaken. Our survey pointed out that traditional knowledge does not percolate in unilinear inheritable manner but it is dependent on number of other socio economic factors also.

All the results were interpreted and compared on the basis of demographic profiles of three selected districts already shown in Table 1.

Calotropis plant is commonly addressed as Aak, Akta and Dudha in their local language which was confirmed to be the same plant after showing them the photographs and voucher specimens etc. *Thevetia peruviana* is commonly addressed as Ashavmar, Haymar and Pita Kaner in their local language. The collected data pointed out that the traditional knowledge about the *Calotropis procera* plant, which grows abundantly in wastelands, is high amongst indigenous people because the plant is growing in close vicinity of their habitation and has a deep religious integration too. Therefore, ethnomedicinal knowledge of this plant is highly diffusing amongst rural people. In case of *Thevetia peruviana*, the pattern or trend of knowledge percolation was altogether variable under similar governing socio-economic factors/ conditions.

Scores were allotted as discussed in materials and methods. Total scores of both the plants were compared and it was deduced that due to higher integration of *Calotropis procera* in rural areas, prevailing traditional knowledge about this plant is more than that of *Thevetia peruviana.*

Graphic representation of scores was done and line graphs were plotted for all the three districts to represent total score attained for traditional knowledge of *Thevetia peruviana* and *Calotropis procera* amongst total informants, male and female informants of three districts.

Pattern and trends of total score of informants in Jind District, Haryana, India:

Thevetia peruviana was not a popular plant amongst total

surveyed population in Jind District. Most of the informants even failed to identify it. On the other hand *Calotropis procera* was easily identifiable and remarkable number of users and knowledge carriers were present (Fig. 1). A replicating trend was observed with reference to only male and only female informants of the Jind district. (Figs.2 & 3). Fig.1 indicates that in total informant's category, line graphs inferred two plateaus in *Calotropis procera*, one at 50 and other at 100 score showing people are knowledge carriers but diffusers are less than carriers. In *Thevetia peruviana*, 3 plateaus are observed, an extended plateau at 0, a condensed plateau at 50 and a very condensed plateau at 100 score showing that maximum people have no knowledge about the plant, few of them are knowledge carriers and very few of them are diffusers. Male & female informants show replicating trend in both the plants (Figs 2& 3).

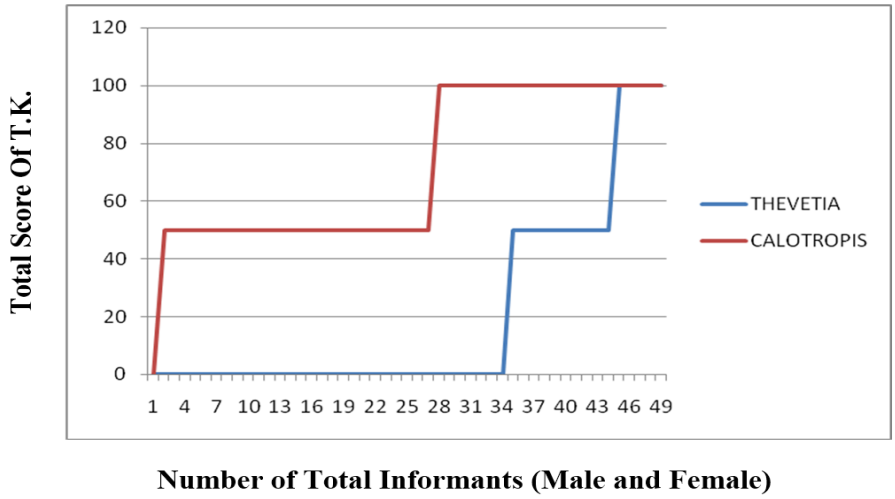

Fig 1: Total score of T.K. amongst total informants of Jind district in *Thevetia peruviana* and *Calotropis procera*

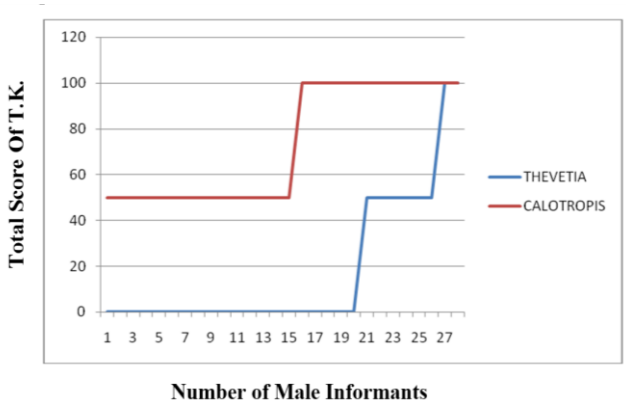

Fig 2: Total score of T.K. amongst only male informants of Jind district in *Thevetia peruviana* and *Calotropis procera*

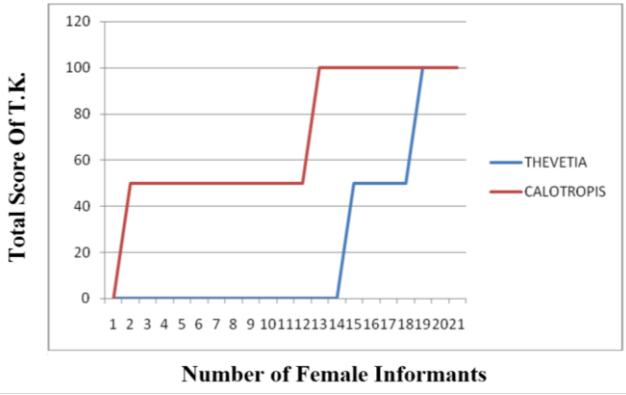

Fig 3: Total score of T.K. amongst only female informants of Jind district in *Thevetia peruviana* and *Calotropis procera*

Pattern and trends of total score of informants in Karnal District, Haryana, India:

Total population surveyed in Karnal District showed an elevated trend in traditional knowledge diffusion in both plants under consideration (Figs. 4 & 5). Most deviating trend was observed in female informants of Karnal district (Fig. 6). Almost all of knowledge carriers were actual users in case of *Calotropis procera.* In total informant category, 3 plateaus are observed in *Calotropis procera*, a very condensed plateau at 0 score, moderately condensed at 50 and an extended plateau at 100 score inferred that people are knowledge carriers, users and diffusers too. In *Thevetia peruviana* the line graph showed 3 plateaus, a less extended plateau at 0, an extended at 50 and very condensed at 100 grade score showing people are knowledge carriers but they are not the diffusers (Fig.5). Male informants show replicating trend of diffusion in both the plants (Fig. 6). Female informants show deviating trend in both the plants. In *Calotropis procera* only one extended plateau is formed at 100 score showing that all of them are knowledge carries and diffusers too. In thevetia peruviana, one extended plateau is formed at 0 and one condensed plateau at 50 grade score showing most of them have no knowledge about the plant and very few of them are knowledge carriers only (Fig.6).

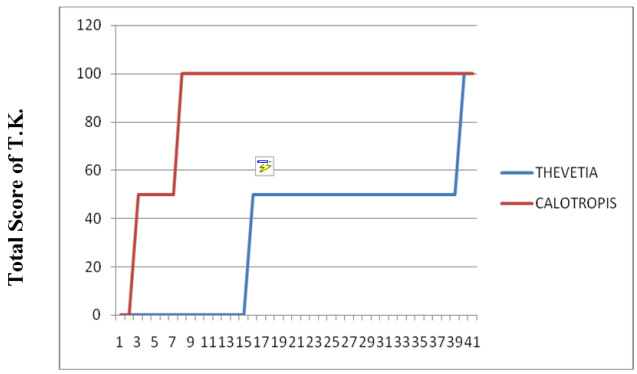

Fig 4: Total score of T.K. amongst total informants of Karnal district in *Thevetia peruviana* and *Calotropis procera*

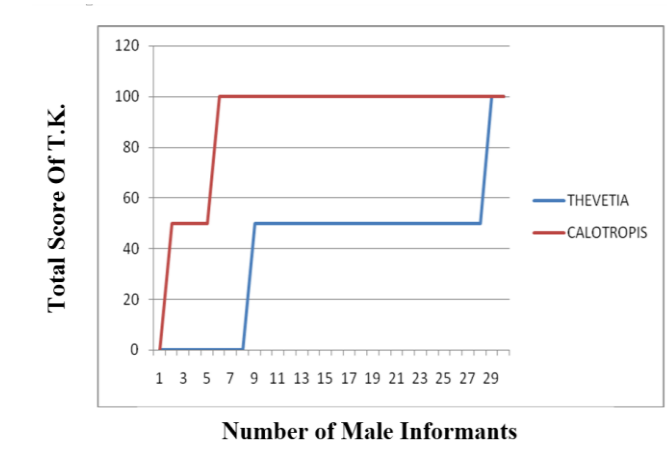

Fig 5: Total score of T.K. amongst only male informants of Karnal district in *Thevetia peruviana* and *Calotropis procera*

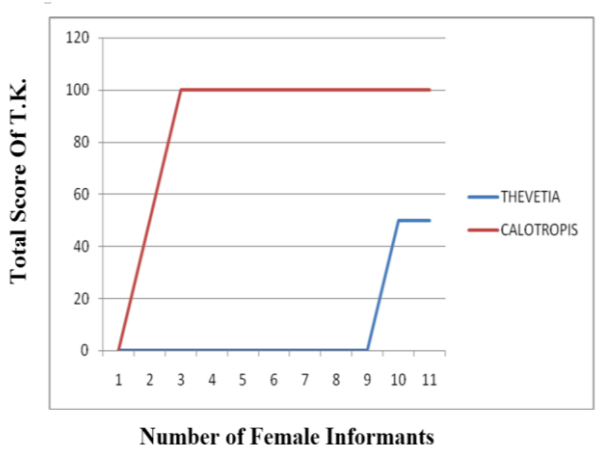

Fig 6: Total score of T.K. amongst only female informants of Karnal district in *Thevetia peruviana* and *Calotropis procera*

Pattern and trends of total score of informants in Rohtak District, Haryana, India:

Amongst total population in Rohtak District, a distinct pattern emerged highlighting almost equal proportion of knowledge carriers and users in total population in *Calotropis procera* and only knowledge carriers and no users in *Thevetia peruviana* (Fig. 7). Male informants for both plants and female informants for *Thevetia peruviana* in Rohtak District followed a same trend as discussed above (Fig. 8). In contrast, female informants emerged as maximum knowledge users in *Calotropis procera* (Fig. 9).

In total informant's category, two plateaus are observed in *Calotropis procera*, one at 50 and other at 100 showing that all of them are knowledge carriers and more than half of them are diffusers too. In *Thevetia peruviana*, 3 plateaus are observed, one at 0, second at 50 and third on 100 grade score indicating almost half of the people are knowledge carriers but very few of them are diffusers too (Fig. 7). A slightly deviating trend was seen in male informant category i.e. diffusion was less in case of *Calotropis procera* and in *Thevetia peruviana*, there are more knowledge carriers but very few of them are diffusers of the knowledge (Fig. 8). In female informant's category, two plateaus are observed in *Calotropis procera*, a condensed plateau to 50 and another extended plateau at 100 grade score showing that most of the knowledge carriers are also diffusers too. In *Thevetia peruviana*, half of the female informants have no knowledge about the plant, rest are carriers only but not diffusers.

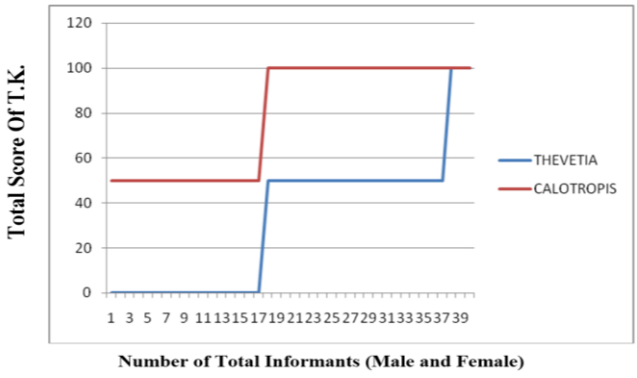

Fig 7: Total score of T.K. amongst total informants of Rohtak district in *Thevetia peruviana* and *Calotropis procera*

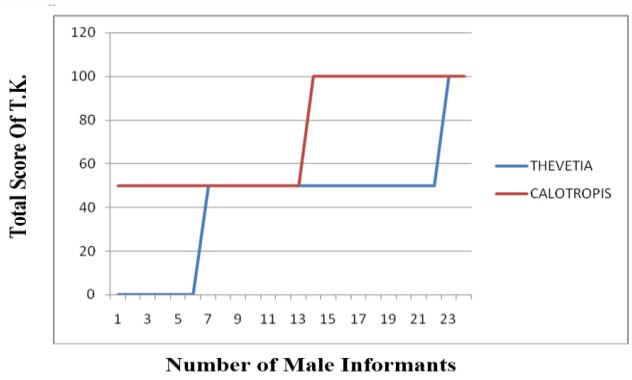

Fig 8: Total score of T.K. amongst only male informants of Rohtak district in *Thevetia peruviana* and *Calotropis procera*

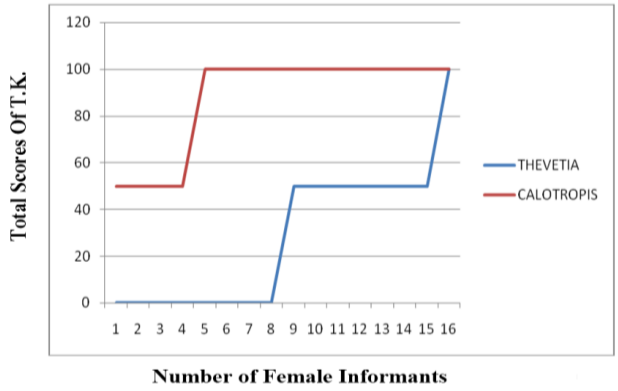

Fig 9: Total score of T.K. amongst only female informants of Rohtak district in *Thevetia peruviana* and *Calotropis procera*

Conclusive trends of line graphs:

In Tables 3, 4 & 5, segregation pattern of users and carriers was studied in all the three districts by calculating the score percentage.

In order to assess the extent of traditional knowledge percolation and utilization of two selected plants amongst rural people of three districts, percent value of informants under three categories ranging between grade scores of 0, 50 and 100 were compiled in Tables 6. This compiled information highlighted that in all three districts, *Thevetia peruviana* showed maximum percent value of grade score 0, i.e. most of the informants failed to even identify the plant except a slightly deviating trend was observed in Karnal district where percent value of male informants and total informants was maximum in grade score 50 indicating that some fragment of traditional knowledge with respect to *Thevetia peruviana* was present only in Karnal district. Interestingly, 100 grade score ranged between 0 to a maximum of 14.28%, indicating that

TK is not in practice or is only in sporadic usage.

In *Calotropis procera*, maximum value fell between 50 and 100 grade score ranged between 0 to a maximum of 42.85% indicating that traditional knowledge is being practiced since ancient times.

Trend of percent value for grade score 0, 50 and 100 in *Calotropis procera* and *Thevetia peruviana* was in reverse order to each other.

Table 3: Showing percent value of informants as per grade score in Jind district

Grade Score	0 (No Knowledge)		50 (Users)		100 (Users And Diffusers)	
Plant	T.P	C.P.	T.P.	C.P.	T.P.	C.P.
Total Informants (%)	69.38	2.04	20.40	53.06	10.20	44.89
Male Informants (%)	71.42	0	21.42	53.57	7.14	46.42
Female Informants (%)	66.66	4.76	19.04	52.38	14.28	42.85

T.P= *Thevetia* peruviana, C.P= *Calotropis procera*

Table 4: Showing percent value of informants as per grade score in Karnal district

Grade Score	0		50		100	
Plant	T.P.	C.P.	T.P.	C.P.	T.P.	C.P.
Total Informants (%)	36.58	4.87	58.53	12.19	4.87	82.92
Male Informants (%)	26.66	0	66.66	13.33	6.66	83.33
Female Informants (%)	81.81	9.09	18.18	9.09	0	81.81

Table 5: Showing percent value of informants as per grade score in Rohtak district

Grade Score	0		50		100	
Plant	T.P.	C.P.	T.P.	C.P.	T.P.	C.P.
Total Informants (%)	42.5	0	50	42.5	7.5	57.5
Male Informants (%)	25	0	66.66	54.16	8.33	48.83
Female Informants (%)	50	0	43.75	25	6.25	75

T.P: *Thevetia peruviana,* C.P: *Calotropis procera*

District wise diffusion pattern of TK

As per our field survey results, the diffusion of TK trend for male, female and total informants is summarized in Table 9.

Table 6 is showing that in *Calotropis procera*, in all three districts total informants show regular diffusion pattern of TK i.e. maximum diffusion in Karnal district, followed by Rohtak and minimum in Jind. Same trend was replicating in male and female informants categories. Whereas, in *Thevetia peruviana*, variable pattern was observed in diffusion of TK. In total and female informants maximum diffusion was in Jind, followed by Rohtak and minimum was in Karnal. But in male informants, diffusion was maximum in Rohtak, followed by Jind and minimum in Karnal.

Table 6: Showing diffusion pattern of traditional knowledge in three districts

Serial No.	Attributes Selected	Diffusion Trend of TK.	
		Calotropis	***Thevetia***
1	Total Informants	K > R > J	J > R > K
2	Male Informants	K > R > J	R > J > K
3	Female Informants	K > R > J	J > R > K

R: Rohak; J: Jind; K: karnal

PCTK strength of *Thevetia peruviana* and *Calotropis procera*:

Table 7 is showing PCTK strength of *Thevetia peruviana* and Table 8 is showing PCTK strength of *Calotropis procera*. The vernacular names of the diseases (also in hindi text) cured by the crude formulations developed and described by the informants are also listed in the tables 7 and 8. *Calotropis procera* is well integrated to our cultural inheritance and hence showed higher PCTK score strength as compared to *Thevetia peruviana* which is weakly integrated to rural folks in socio-cultural practices. Tables 7 & 8 are clearly indicating that *Thevetia peruviana* has more of ornamental value than its medicinal value. While in *Calotropis procera* more number of medicinal uses were listed. Stronger PCTK score strength in *Calotropis procera* shows that the plant is in deep integration with society and more specifically for ethnomedicinal purposes.

Table 7: PCTK strength in *Thevetia peruviana*

S. NO.	Ethnomedicinal uses	PCTK Strength (%)
1	Ornamental Value	48.83
2	To cure skin Infections	2.32
3	*To kill animals	2.32
4	To cure fever	1.55
5	To cure stomach Inflammation	0.77
6	To cure earache	0.77
7	Nasal/Eye drops formulation	0.77
8	To cure leprosy	0.77
9	Diuretic	0.77
10	Improves Blood circulation	0.77
11	Induce abortion	0.77
12	Induce menstruation	0.77
13	Used as Sedative	0.77
14	To cure cough	0.77

*Use was not earlier cited in literature but information was narrated by informants during survey.

Table 8: PCTK strength of *Calotropis procera*

S. No.	Ethnomedicinal uses	PCTK Strength (%)
1	Religious value	94.0
2	Thorn removal	91.47
3	To cure joint pain	31.78
4	To cure toothache	19.37
5	To cure boils	17.82
6	To cure asthma	16.27
7	To cure skin diseases	13.95
8	To cure snake bite	8.52
9	To cure cough	7.75
10	Blood purifier	5.42
11	To cure cyclic fever	4.65
12	To cure jaundice	3.87
13	To cure piles	3.87
14	To cure stomachache	3.87
15	To cure wasp bite	3.87
16	To cure chest Congestion	2.32
17	*To cure gastric trouble in animals	2.32
18	To cure earache	2.32
19	Wound healing	2.32
20	To cure ring worm	1.55
21	To cure corns	0.77
22	To cure flatulence	0.77
23	Removal of intestinal worms	0.77
24	To cure chicken Pox	0.77

*Use was not earlier cited in literature but information was narrated by informants during survey. Leaves of *Calotropis* are fed along with fodder directly to the animals.

In *Thevetia peruviana*, a very alarming threat to ethnomedicinal usage was observed i.e. out of a total of 14 listed uses, 10 uses could score merely 0.77% indicating that the knowledge is not at all percolating and is at high threat of its loss in the society. Furthermore, other four uses scored less than 3% PCTK score. 48% of the PCTK score was only for its ornamental value (Fig.12). On the other hand, in *Calotropis procera*, out of a total of 24 ethnomedicinal uses, four scored 0.77 while 13 uses scored less than 10%. Only one use of *Calotropis* latex for thorn removal is in wide usage indicating a gradual denudation of many of the other known uses for want of a mechanism to diffuse and percolate the TK in the society (Fig.13).

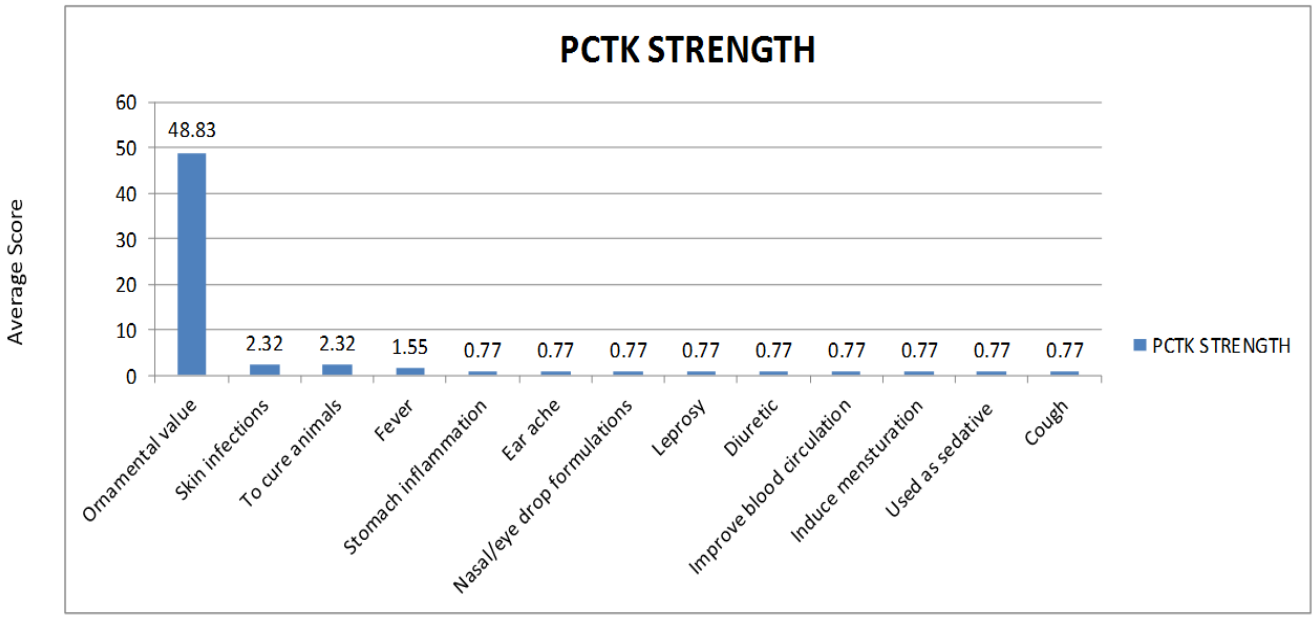

Fig 12: PCTK strength of *Thevetia peruviana*

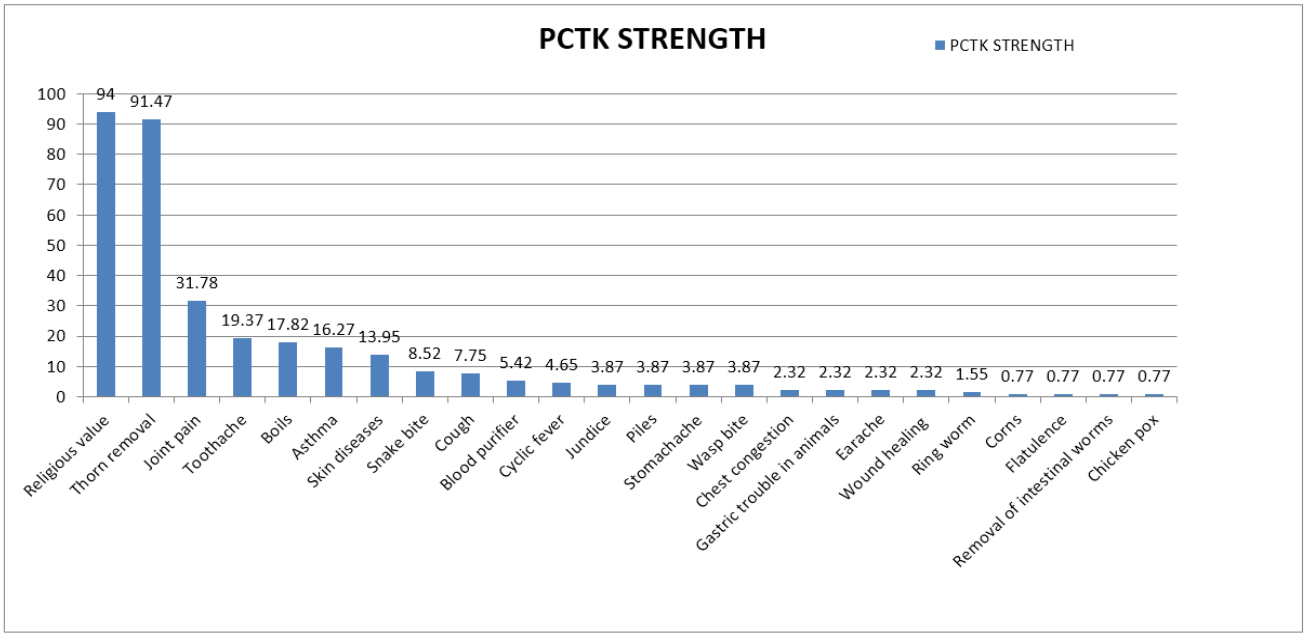

Fig 13: PCTK strength of *Calotropis procera*

Conclusion

The present survey concludes that two plants with variable socio-cultural integration showed totally opposite trend of percolation of traditional knowledge in all the three districts of Haryana. In case of *Thevetia peruviana*, a large number of informants were unable to even identify the plant. Some of the informants were only knowledge carriers while very few were the actual users. Various criteria laid down for survey failed to classify the data into interpretable form and the authors suggest that TK in the rural society is not under the governance of various socio economic factors such as age, sex, qualification and income etc. Therefore, a person to person contact information compiled ultimately into PCTK score is the only scientific way to conserve and compile ethnomedicinal knowledge.

A fairly contrasting trend was observed in *Calotropis procera*. Almost all the informants were able to identify the plant. Maximum number of informants were actual users also. The most deviating trend of diffusion and percolation of TK was observed amongst female informants of Karnal district who were least knowledge carriers. This trend indicates that *Calotropis procera* is more common amongst rural people and

also people are using it for medicinal purpose. On the other hand, in *Thevetia peruviana* very few people are using the plant for medicinal purposes. On the basis of PCTK score strength again *Calotropis procera* emerged as a plant having deep ethnomedicinal social integration. According to the survey, lesser PCTK score strength indicated that the plant is endangered or threatened ethnomedicinally. A medicinal use in recurrence is supported by very high PCTK strength e.g. thorn removal in *Calotropis procera* with a PCTK score strength of 91.47% and a sporadic use has a very low PCTK score strength e.g. sedative usage of *Thevetia peruviana* with a PCTK score strength of 0.77% (Tables 7 & 8). Moreover, *Thevetia peruviana* is known for its ornamental value amongst rural people whereas *Calotropis procera* is known for its age old ethnomedicinal properties and religious integration. Keeping in view the emerging variable trend in these two plants specific plant protection and traditional knowledge conservation strategies need to be formulated. Such an approach will help us screen and utilize our unfathomable traditional knowledge resource for future planning and benefits. At present more emphasis is being laid on theoretical documentation of TK whereas authors conclude and strongly recommend to device a mechanism of person to person collection of this knowledge along with strategies to promote their efficient percolation in the society. This will further help in practically conserving the TK and its use for mankind.

Our survey pointed out that traditional knowledge does not percolate in unilinear manner. Instead it is governed by a number of other dependent factors. Therefore, authors intend to propose a dire need to establish an IPCTKW which will enable future researchers to plan and prioritize their focus areas of medicinal plant research. Such protection strategy will not only project medicinal significance of select plant but also point towards future policies, plans and strategies for protection and conservation of ethnomedicinally threatened plants. Finally, generation of IPCTKW will help us create a knowledge pool for plant drug based researches and it will also prioritize selection of thrust areas to develop efficacious plant based drugs.

List of abbreviations used

TK: Traditional knowledge; PCTK: Persons Carrying Traditional Knowledge; IPCTKW: Integrated Persons Carrying Traditional Knowledge Web; C.P.: *Calotropis procera*; T.P.: *Thevetia peruviana*; J: Jind; K: Karnal; R: Rohtak.

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References

1. Ahuja U, Thakrar R, Nathwani P, Ahuja SC. Role of Religion in Conservation of Plant Biodiversity, Kaul. Asian Agri-History 2001; 5(3):225-248.
2. Raut S, Raut S, Sen SK, Satpathy S, Pattnaik D. An ethnobotanical survey of medicinal plants in Semiliguda of Koraput district, Odisha, India, Botany Research International 2012; 5(4):97-107.
3. Dixit U, Goyal VC. Traditional Knowledge from and for elderly. Indian Journal of Traditional Knowledge. 2011; 10(3):429-438.
4. Verma R, Satsangi GP, Shrivastava JN. Ethno-Medicinal Profile of Different Plant Parts of *Calotropis procera* (Ait.) R. Br. Ethnobotanical Leaflets 2010; 14:721-42.
5. Wadankar GD, Malode SN, Sarambekar SL. Indigenous Medicine Used for Treatment of Gynecological and other related Problems in Washim District, Maharashtra, Int. J Pharm Tech Res. 2011; 3(2):698-701.
6. Sherpa MT, Mathur A, Das S. Medicinal plants and traditional medicinal system of Sikkim: A review. World Journal of Pharmacy and Pharmaceutical Sciences. 2015; 4(2):161-184.
7. Durmuskahya C, Ozturk M. Ethnobotanical survey of medicinal plants used for the treatment of Diabetes in Manisa, Turkey. Sains Malaysiana 2013; 42(10):1431-1438.
8. Das DC, Sinha NK, Das M. The use of medicinal plants for the treatment of gynaecological disorders in the Eastern parts of India. Indian Journal of Obstetrics and Gynaecology. 2015; 2(1):16-27.
9. Kew F. The useful plants of west tropical Africa. Families A-D Edition (ed. Burkill, H.M.) Royal Botanical Gardens 1985; 1:219-222.
10. Dhar ML, Dhar MM, Dhawan BN, Mehrotra BN, Ray C. Screening of Indian medicinal plants for biological activity, Part I. Ind. J Exp Biol. 1968; 6:232-247.
11. Ajibade LT, Fatoba PO, Raheem UA, Odunuga BA. Ethno medicine and primary health care in Iiorion, Nigeria. Indian J Traditional Knowledge. 2005; 4(2):150-158.
12. Mishra HP, Fridowich I. The role of super oxide anion in the autooxidation of epinephrine and a simple assay for superoxide dismutase. J Biol Chem. 1972; 247:3170-3185.
13. Khan FM. Ethnoveterinary medicinal usage of flora of greater Cholistan Desert, Pakistan. Pak. Vet. J. 2009; 29(2):75-80.
14. Thakkar R, Vaghela B, Buddhadev S. A valuable plant *Calotropis procera* Linn. In Indian system of medicine: Ayurveda. Pharma Science Monitor 2014; 5(1):151-163.
15. Ibiyemi SA, Fadipe VO, Akinremi OO, Bako SS. Variation in Oil Composition of *Thevetia peruviana* juss (Yellow Oleander) Fruits Seeds, J Appl Sci Environ Mgt. 2002; 6(2):61-65.
16. Ibiyemi SA, Faloye T. Potassium, Nitrogen and Calcium uptake by *T. peruviana* seedlings as affected by various nutrient sources. Nig, J Agronomy. 1988; 3(2):68-73.
17. Ibiyemi SA, Oluwaniyi OO. Efficacy of catalysts in the batch esterification of the fatty acids of *T. peruviana* seed oil, J Appl Sci Environ Mgt. 2003; 7(1):15-17.
18. Turner GP. Introduction to paint chemistry and principles of paint chemistry and paint technology, 3rd ed. Chapman and Hall, 1988, 108-169.
19. Bisset NG. Cardiac glycosides. IV, Apocyanaceae: a preliminary paper chromatographic studies of the glycosides from *T. peruviana.* Ann. Bogor 1963; 4(2):145-152.
20. Sun NC, Libizor NI. The glycosides of *Thevetia. peruviana* 1965; 6:20496.
21. Atteh JO, Ibiyemi SA, Ojo AO. Response of broilers to dietary levels of *Thevetia* cake, J Agric Sci Cambridge. 1995; 125:307-310.
22. Oluwaniyi OO, Ibiyemi SA, Usman AL. Effect of detoxification on the nutrient content of *Thevetia*

peruviana seed cake. Res, J of Applied Sci. 2007; 2(2):188-191.
23. Kaur J, Rani S, Singh G, Sood N. Ethnomedicinal knowledge reserves amongst rural women in Jind district of Haryana, India. Journal of Medicinal Plants Studies. 2015; 3(2):111-114.
24. Kaur J, Rani S, Singh G, Sood N. Trends of diffusion and denudation of traditional knowledge in two medicinally important plants-*Calotropis procera* and *Thevetia peruviana* in villages of Rohtak district, Haryana, India. Journal of Medicinal Plants Studies. 2015; 3(5):14-19.
25. Oluwaniyi OO, Ibiyemi SA. A study of the extractability of Thevetia glycosides with alcohol mixture. African Journal of Biotechnology. 2007; 6(18):2166-2170.
26. Quave CL, Pieroni A. A reservoir of ethnobotanical knowledge informs resilient food security and health strategies in the Balkans.Nature Plants 2015; 10(1038):21.
27. https://www.census2011.co.in. 19 May, 2015.