

## Efficacy of Ayurvedic Classical and Modified Formulations on Skin Disorders

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### Abstract

Acne, eczema, psoriasis, vitiligo, hyper pigmentation, seborrhic dermatitis, etc. have been found with high prevalence in Gujarat. There are so many effective formulations in Ayurveda prescribed by Ayurvedic physicians in various skin disorders for many ages. IPGT & RA, the leading institutes of Ayurveda is working on the aims to generate evidences of safety and efficacy of Ayurvedic classical and modified formulations. Present work is a compilation of clinical research works carried out in RSBK department of IPGT and RA at MD and PhD level on different skin disorders. Various popular herbal and herbomineral formulations were clinically evaluate on five skin diseases under the headings *Kshudra kushtha* (common skin diseases), *Vicharchika* (Eczema), *Ekakushtha* (Psoriasis), *Mukhadushika* (Acne) and *Shvitra* (Vitiligo). Ayurvedic classical formulations showed significant results on different skin diseases. Modifications of classical formulations into contemporary forms are convenient and also effective. Herbo mineral formulations prepared from metals and minerals were also found safe and efficacious internally as well as externally. These studies are reflecting the methodologies in current Ayurvedic clinical research and drug development.

**Key Words:** Acne, Eczema, Psoriasis, Research methodology, Vitiligo

### Introduction

Skin disorders are very common in India and their incidences and patterns differ according to the region. The prevalence of skin diseases in the general population of India has varied from 7.86% to 11.16% in various studies.<sup>[1]</sup> In Gujarat acne, eczema, psoriasis, vitiligo, hyper pigmentation, seborrhic dermatitis, etc. have been found with high prevalence.<sup>[2]</sup> Ayurveda, the traditional medicinal system of India offers a wide range of formulations prepared from herbal, metal or mineral ingredients. These formulations are successfully prescribed by Ayurvedic physicians in various skin disorders for many ages. Evidence based safety and efficacy of these formulations are the great needs of an hour. Classical inconvenient dosage forms may be modified with contemporary scientific tools. IPGT and RA (Institute for Post Graduate Teaching & Research in Ayurveda) is one of the prime institute working with the aim of research and development of Ayurveda.<sup>[3]</sup> RSBK (*Rasa shastra* and *Bhaishjya kalpana*) department of the institute is leading in Ayurvedic drug development, drug

standardisation, preclinical and clinical pharmacology of Ayurvedic formulations. From 1968 to present days, so many research works have been carried out at MD and PhD level to establish the role of Ayurvedic formulations on various skin disorders. Here, in this review a humble attempt is carried out to compile the scattered evidences of Ayurvedic formulations clinically evaluated for their role in the management of skin disorders conducted at department of RSBK, IPGT & RA, Gujarat Ayurved University, Jamnagar. This work may be helpful for further research works.

## Materials and Methods

Research works carried out in RSBK department of IPGT and RA at MD and PhD level were screened for the review. Researches in Ayurveda (by M S Baghel) a compilation book on PG & PhD thesis works in Ayurveda conducted in well-known academic Ayurvedic institutes of India<sup>[4]</sup>, Ayurved Research Database (ARD) software comprising detailed research works of IPGT & RA and central library of the institute were used to search the full text dissertations.

## Inclusion criteria

Works comprising of Ayurvedic clinical studies on skin disorders conducted by RSBK department were included. The works completed in between 1968 to 2016 were incorporated in the study. Works on herbal and herbo-mineral drugs, compound formulations intended for internal, external or both were considered for the study.

## Exclusion criteria

Studies on skin disorders from other departments of IPGT and RA were excluded. Incomplete and ongoing studies were also excluded.

## Assessment criteria

Special proforma was prepared including points such as formulations (single/compound and herbal/herbomineral), mode of administrations (internal/external), dose, duration, vehicles (*anupana/sahapana*), study types (open label/blinding), randomization, CTRI registrations, effect of therapy etc. Statistical tools like charts and diagrams were used for better presentation of the data.

## Observations and Results

Total 152 dissertations from MD (Ayurveda) and 43 works from PhD (Ayurveda) taken from RSBK department of IPGT and RA were screened. Amongst them, 30 clinical research works on skin disorders were included in this study in which, 24 were from MD and 6 were from PhD studies. One study Nehru *et al.*, 1969<sup>[5]</sup> could not be included due to unavailability of the manuscript. They were further divided in five major groups of different types of skin diseases i.e. *Kshudra kushtha* (common skin diseases), *Vicharchika* (Eczema), *Ekakushtha* (Psoriasis), *Mukhadushika* (Acne) and *Shvitra* (Vitiligo). Total number of the treated patients in each group is shown in figure 1.

Details of the Research works, treatment regimen, sample size, duration and results are tabulated in table 1. Studies showing comparison between classical and contemporary modified formulations are given in table 2. In comparative clinical trials, different pharmaceutically modified formulations were incorporated. These modifications were based on media, ingredient, method, dose and duration. (Table 3)

## Discussion

### Type of the studies

Most of the studies were open label, comparative clinical studies. Ayurvedic therapy is based on multi component formulations. These formulations are also prescribed with proper vehicle, known as *anupana* and *sahapana*. So, it is difficult to include blinding study in this protocol. Two trials were placebo control trials. Roasted suzy and starch were used as placebo. In comparative trials, randomization methods like coin test, computer generated charts were found in latest studies. CTRI registration was found in all trials after 2010. Studies had occupied IEC permission prior to start of the trials. Studies containing all necessary tools like clinical proforma, inclusion and exclusion criteria, patient consent, demographic data, statistical analysis, discussion and conclusion.

### Aim of the studies

Some studies have been carried out to find out clinical efficacy of classical Ayurvedic formulations. Some studies were planned to compare efficacy of two different classical formulations. In some studies, classical formulations have been converted into contemporary dosage forms and their efficacy was compared with classical. Some formulations were prepared with different methods or media and compared with original form. In some studies role of *anupana* was established. Some studies showed the role of different *samskara* like *bhavana*, *shodhana*, etc. in drug formulations and in clinical efficacy. In a nut shell, the aim of all the studies was to find out some new formulations with the help of contemporary science and generate the evidences regarding clinical efficacy of classical and contemporary modified formulations.

### Type of the formulations

Total 11 studies were conducted on herbal formulations while rest of the 19 were conducted on herbo mineral formulations. Among herbo mineral formulations, nine contained single metal/ mineral as chief ingredient while among herbal formulations, seven were containing single herb as a chief ingredients. Clinical efficacy of particular drug was found to be more precisely stated if the formulation contains single chief ingredient (in predominantly higher proportion). Modifications in classical formulations are carried out for getting better palatability, shelf life, convenience and marketing purpose. The efficacy and safety of these modified formulations are prime concern. Hence, they must be evaluated and compared with classical formulations.

## Mode of administration

As skin disorders are a result of internal as well as external pathologies, most of the studies comprised internal (oral) and external administration. Some studies were conducted to compare the internal and external effect of same formulation.

## Sample Size

Sample size was less in earlier studies, while it was found to be increased in the recent studies carried out after 2005. That may be due to increased awareness towards Ayurveda and implications of research protocols in Ayurvedic studies. In comparison to MD studies, sample size was found to be more in PhD studies.

## Dose, Duration, *Anupana* and *Pathya-apathya*

Prescribed dose of the formulations was as per classical texts. Dose of herbomineral formulations was less than herbal formulations, as they are comparatively more potent. Duration in majority of the studies was 1 month. In case of *Shvitra*, the duration of treatment was two to three months. *Shvitra* is more difficult to treat, so more duration is needed. *Anupana* and *sahapana* have very important role in the treatment protocol. Different *anupana* like water, honey, milk were used in these studies. Role of different *anupana* was tested by some studies like Thaker *et al.* *Pathya-apathya* are guidance for diet and daily routine influencing course and fate of the disease. Dietary restrictions are very important along with treatment and were found advised in all the studies.

## Assessment criteria and statistical analysis

Assessment criteria in these studies were included in symptomatology of Ayurvedic classics along with contemporary science. Some special scoring pattern like VASI (Vitiligo Area Scoring Index) and PASI (Psoriasis Area Scoring Index) score, QOL (Quality Of Life) score, Candle grease sign, Auspitz sign, Koebner phenomena, etc. were also found adopted in some recent works. (Table 4) Percentage of improvement in each parameter in all the treated groups was calculated and overall effect was counted as per table 5. The data obtained in these clinical studies were subjected to appropriate statistical tests like Paired and Unpaired 't' tests, Wilcoxon signed rank test, Chi square test, ANNOVA test etc. The level of significant was counted as Insignificant at  $> 0.05$ , Significant at  $\leq 0.05$ ,  $\leq 0.01$  and Highly significant at  $\leq 0.001$ .

## Adverse drug reactions (ADRs)

As the formulations are containing metallic and mineral ingredients, safety is a major concern. All the formulations were found to be safe to use internally as well as externally in this review. Several formulations like *Rasa karpura*, *Rasa sindura*, *Vit 8 lepa*, *Bakuchi oil*, *Savarnakara lepa* had showed mild adverse drug reactions which were subsided by themselves or with a handful management. In *kshudra kushtha* disease, Swayam Prakashma

K *et al.* had noted blisters developed in 4 patients (2 patients per each Group of *Rasasindura*) which were relieved without stopping the treatment. Mehta *et al.* found in their MD study that, 4 patients were complaining of burning sensation after application of *Rasakarpura Drava*. In their PhD study, they found two patients (one from each group) complaining of severe burning sensation, oedema and pain after application of RKD (*Drava* and Jel). Thaker *et al.* had reported excessive diarrhoea in three patients and nausea in two patients due to *Kampillaka churna* capsules taken internally in the cases of *Vicharchika*.

In *Shvitra*, Tank *et al.* had reported the blister formation in 5.26% patients within 2 weeks of therapy in Group A (Vit-8 *lepa*) and in 7.89% patients in Group B (Vit-8 oil) within 2 to 6 weeks and 7.89% in Group C (*Bakuchi* oil) within 4 to 8 weeks. Shingadiya *et al.* had found small blisters in eight patients of group A (*Savarnakara Lepa*) and three in group B (*Savarnakara* Ointment). Occurrence of blisters is a natural phenomenon and positive sign in the management of *Shvitra*.<sup>[6]</sup>

### Strength of the studies

Included studies in this review showed basic evidences for clinical safety and efficacy of Ayurvedic herbal and herbo mineral formulations. Ayurvedic classical formulations were converted into modified form by using contemporary methods. Conversion of *lepa* into oil, ointment, jel or vaselline was found to be easy and convenient to use. Contemporary methods like distillation, soxhlet, etc may be used for extraction. For fermentation process, yeast may be alternative of classical fermenting agents. Such innovations are first step towards globalization of Ayurveda.

### Limitations of the studies

Some lacunas were found in the studies included in the review. Non controlled trials, unable to double blind the formulations in many studies, limited duration of the treatment, restrictions in application of standard clinical guidelines as per Ayurvedic principles are the limitations of the studies. Ayurvedic science believes in individual management for individual subject. The management or medicines prescribed to one patient may not be suitable for others because of the different factors like *Rogabala* (severity of disease), *Rogibala* (strength of patients), *desha* (region), *Kala* (season), *Vaya* (age), *Mana* (dose), etc.<sup>[63]</sup> It is very difficult to show consistency in all these parameters in clinical trials. It is also difficult to find out the Ayurvedic formulations which can be taken as control in RCTs. These may be the reasons why Ayurvedic clinical trials seem dreary in comparison with contemporary science. Hence, special research methodologies should be developed according to Ayurvedic principles.

## Conclusion

The review suggests that Ayurvedic classical formulations have great potential to treat different skin diseases. Herbo mineral formulations prepared from metals and minerals were also found safe and efficacious internally as well as externally. In Ayurvedic treatment protocols, method of preparations, dose, *anupana*, *sahapana*, duration, *pathya- apathya*, etc are essential components and clinical trials should be planned according to them. Modifications of classical formulations into contemporary form are convenient and also effective. More studies should be carried out in this direction. These studies are reflecting the methodologies in current Ayurvedic clinical research and drug development and this review may help in future clinical studies.

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**Table 1: Outcome of the research works carried out on skin disorders**

Research Scholar	Regimen	Sample size	Durati on (Day)	Observations and Results
<i>Kshudra Kushtha</i> (Common skin disorders)				

Acharya JG <i>et al.</i> <sup>[7]</sup> (MD, 1968)	Gp A: <i>Arogyavardhini Rasa (AR)</i> <sup>[8]</sup> 1 g (n=8) Gp B: <i>AR+ Triphala</i> 250mg + <i>Gandhaka</i> 500 mg (n=6) Gp C: Ingredients of Gp B + <i>Vanga Bhasma</i> 250mg + <i>Manjishthadi Kwatha</i> <sup>[9]</sup> (n=5) Gp D: Ingredients of Gp C+ <i>Marichyadi Taila</i> Ext(n=6)	25	15 to 60	In Gp A: 87% in <i>raksa</i> , 50% in <i>dadru</i> . Gp B: 42% relief in 17 days. Gp C: 66% in <i>raksa</i> , 100% in <i>dadru</i> & 50% in <i>charmadala</i> . Gp D: 75% in <i>raksa</i> & 62% in <i>pama</i> .
Harwlkar RJ <i>et al.</i> <sup>[10]</sup> (MD, 1976)	Gp A: <i>Chandramarutam Chanduram</i> (n=18) ( <i>CMC</i> ) Gp B: <i>CMC</i> (Modified) (n=18), Both qs for local application with <i>Navaneeta</i> (Butter)	36	30	Cured 83.32%, marked 13.88% & no relief 2.5%
Swayam Prakashma K <i>et al.</i> <sup>[11]</sup> (MD, 1986)	Gp A: <i>Rasasindoor</i> ( <i>RS</i> ) <sup>[12]</sup> (168 hrs) (n=15) Gp B: <i>RS</i> (6 hrs) (n=12) Both 250 mg twice a day with milk. Ext: <i>RS malhara</i> QS in both Gps.	27	30	In Gp A & B respectively, cured 46.66% & 25%, marked 40% & 33.33%, & mild 13.34% & 41.67%
Anadakat HA <i>et al.</i> <sup>[13]</sup> (MD, 1988)	Gp A: <i>Rasamanikyam (RM)</i> <sup>[14]</sup> prepared with <i>Sarava samputa</i> (n=6), Gp B: <i>RM</i> prepared with <i>Abhraka patra</i> (n=6), Gp C: <i>RM</i> prepared with <i>Kupipakva</i> (n=6). Dose 125 mg twice a day with water for all gps.	18	21	In Gp A, B & C respectively, cured 33.33%, 50% & 33.33%, marked 33.33%, in each, mild 33.33% in Gp A & B while 16.67% unchanged in Gp C.
Mehta N <i>et al.</i> <sup>[15]</sup> (MD, 2007)	Gp A: <i>Rasakarpura Drava( RKD)</i> <sup>[16]</sup> QS twice a day Ext (n=37) Gp B: <i>Gandhaka Malahara</i> QS twice a day Ext (n=28)	65	30	<i>Vicharchika</i> , Gp A 25% cured & Gp B 66.67% marked, <i>Ekakushtha</i> , Gp A 16.67% cured, 66.67% marked, Gp B 100% marked. <i>Dadru</i> Gp A 28.57% & Gp B 62.50% cured.
Dhruve K <i>et al.</i> <sup>[17]</sup> (MD, 2007)	Gp A: <i>Khadirarista</i> <sup>[18]</sup> prepared by sugar (n=15) Gp B: <i>Khadirarista</i> prepared by jaggery (n=10) Dose 20ml twice a day after meals for Both	25	28	Gp A & B respectively marked 26.6% & 50.00%, moderate 53.33% & 40.00% , mild 20.00% & 10.00%.
Pilai K U <i>et al.</i> <sup>[19]</sup> (PhD, 1990)	<i>Hartala Bhasma</i> 65mg thrice a day with water orally. Extly <i>Siktha taila</i> (Sesamum oil & yellow paraffin in 5:1 ratio) once a day. (n=20)	20	21	67.5% symptomatic relief was observed in general symptomatology.

Mehta N <i>et al.</i> <sup>[20]</sup> (PhD, 2012)	Gp A: <i>Rasa Karpura Drava</i> <sup>[21]</sup> (n=60) Gp B: <i>Rasa Karpura Jel</i> <sup>[22]</sup> (n=60). Dose: QS for Ext application, twice a day for both.	120	28 FU:14	In Gp A & B respectively, <i>Vicharchika</i> (55.54% & 59.29%), <i>Eka Kustha</i> (43.94% & 60.47%), <i>Pama</i> (63.67% & 69.78%), <i>Vipadika</i> (64.30% & 66.24%), <i>Dadru</i> (64.74% & 54.09%), <i>Charma Kustha</i> (75.00% & 57.10%)
Yadav P <i>et al.</i> <sup>[23]</sup> (PhD, 2013)	Gp A: <i>Godugdha Shodhita Gandhaka</i> <sup>[24]</sup> (500mg bd with luke warm milk) & <i>Gandhaka malahara (GM)</i> Ext (n=34), Gp B: <i>Bhringaraja Swarasa Shodhita Gandhaka</i> <sup>[25]</sup> (Same dose as A) & <i>GM</i> Ext (n=34), Gp C: <i>Godugdha Shodhita GM</i> Ext. (n=34) Gp D: <i>Bhringaraja Shodhita GM</i> Ext (n=33)	135	28 FU: 14	Gp A, B, C & D respectively, marked 38.24%, 20.59%, 14.71% & 12.12%, moderate 61.76, 73.53%, 79.41% & 78.79%, mild 0.00%, 5.88%, 5.88% & 9.09%.
<i>Vicharchika</i> (Eczema)				
Yeriswamy H <i>et al.</i> <sup>[26]</sup> (MD, 1984)	Capsule (500g) of <i>Rasakarpura</i> <sup>[27]</sup> & <i>Twaka</i> (1:40). Dose 1 bd for < 1year chronicity, 1 tds for >1year chronicity, 1 od for child < 5 years. (n=15)	15	21	Cured 46.66%, marked 40%, mild 13.33%
Thaker A V <i>et al.</i> <sup>[28]</sup> (MD, 1985)	Gp A: <i>Kampillaka Malahara (KM)</i> <sup>[29]</sup> prepared with <i>Siktha Taila</i> Ext (n=15), Gp B: <i>KM</i> prepared with Vaseline(n=15). Int in both Gps: <i>Kampillaka</i> powder in a capsulated form (500mg) twice a day with water.	30	28	In Gp A & B respectively, Cured 60% & 26.66%, marked 26.66% & 20.00%, mild 13.33% & 33.33%. No relief in Gp B 20%.
Thaker H <i>et al.</i> <sup>[30]</sup> (MD, 1999)	Gp A: <i>Gandhaka druti</i> <sup>[31]</sup> (Classical) 3 to 5 drops with <i>Nagavalli patra swarasa</i> once in a morning (n=6), Gp B: <i>Gandhaka druti</i> (Modified) with <i>Batasa</i> (n=21)	27	30	In Gp A & B respectively, marked 33.33% & 47.14%, moderate 66.67% & 42.86%.
Mishra D K <i>et al.</i> <sup>[32]</sup> (MD, 1999)	Gp A: <i>Rasamanikya</i> <sup>[33]</sup> 100 mg once in morning with water (n=7), Gp B: <i>Yasadamrta malhara (YM)</i> <sup>[34]</sup> qs for local application twice a day(n=6), Gp C: <i>RM</i> Int. & <i>YM</i> Ext(n=9).	22	30	In Gp A, B & C respectively, cured 4.55%, 13.64% & 36.36%, marked 27.73%, 13.64% & 4.55%. moderate 4.55% in Gp A.
Mashru M <i>et al.</i> <sup>[35]</sup> (MD, 2001)	Gp A: <i>Madhusunuhi</i> (MS) <i>Rasayana</i> prepared by classical method (n=12) Gp B: MS <i>Rasayana</i> prepared by <i>Kwatha</i> (n=9) (Dose- 12 gm with warm water once a day)	21	30	In Gp A & B respectively, marked 16.67% & 11.11%, moderate 58.33% & 66.67%, mild 25% & 22.22%

Druve K <i>et al.</i> <sup>[36]</sup> (PhD, 2013)	Gp-A: <i>Kanakabindvarishta</i> <sup>[37]</sup> prepared by classical method (n=31) Gp-B: <i>Kanakabindvarishta</i> prepared by adding yeast (n=31) Dose: in both Gps- 20 ml twice a day after meal	62	30	In Gp A & B respectively, Cured 9.09% & 3.03%, marked 39.09% & 9.09%, while moderate 36.36% & 39.39%. 9.09% mild in Gp A while 3.03% unchanged in Gp B.
Pandya K <i>et al.</i> <sup>[38]</sup> (MD, 2013)	Gp A: <i>Kampillaka Malahara</i> QS for topical Application (n=29). Gp B: <i>Gandhaka Malahara</i> QS for topical application (n=30). Int. in both Gps- 3 g of <i>Rasayana Churna</i> along with water	59	28 FU: 14	Both the groups have shown highly significant relief on all the signs & symptoms of <i>Vicharchika</i>
<i>Ekakushtha</i> (Psoriasis)				
Barvalia R <i>et al.</i> <sup>[39]</sup> (MD, 2000)	Gp A: <i>Panchatikta Ghrita</i> <sup>[40]</sup> prepared with <i>Ghrita Murcchana</i> & <i>Triphala Kalka</i> (n=13), Gp B: <i>Panchatikta Ghrita</i> prepared with <i>Ghrita Murcchana</i> (n=13), Gp C: <i>Panchatikta Ghrita</i> prepared without <i>Ghrita Murcchana</i> & <i>Triphala Kalka</i> (n=11) Dose: 5 ml twice a daily in all Gps.	37	30	Comparative relief of treatment regimens on clinical parameters was 55.5% in Gp A, 35.93% in Gp B & 29.31% in Gp C.
Zala U <i>et al.</i> <sup>[41]</sup> (MD, 2004)	GpA: <i>Murchhita Panchatikta Ghrita</i> (n=10), Gp B: <i>Avartita Panchatikta Ghrita</i> (n=11) Dose: 10 gm per day int.	37	30 FU: 30	In Gp A & B respectively, marked 55.55% & 70%, moderate 22.22% & 20%, mild 11.11% & 10%, unchanged 11.11% in Gp A
Vaghmashi R <i>et al.</i> <sup>[42]</sup> (MD, 2006)	Gp A: <i>Guduchi Taila</i> orally (5 gm twice daily) & Ext Gp B: <i>Guduchi Ghrita</i> orally (5 gm twice daily) & Ext	27	28 FU: 30	Gp A shows better result with Cured 20%, moderate 44%, marked 36%, mild 10.53%.
Shrimanna rayan K <i>et al.</i> <sup>[43]</sup> (MD, 2006)	Gp A: <i>Rasa Manikya</i> 125 mg once per day. (n=15) Gp B: <i>Rasa Manikya</i> 125 mg twice per day. (n=12) Gp C: Placebo (starch) 250 mg twice per day (n=10)	37	28 FU: 30	All the primordial symptoms of <i>Eka Kushtha</i> were relieved by <i>Rasa Manikya</i> in both the Gps in comparison with control Gp.
Umrethiya B <i>et al.</i> <sup>[44]</sup> (MD, 2008)	Gp A: <i>Guduchi Ghana</i> prepared by <i>Kwatha</i> methods <sup>[45]</sup> (n=17) Gp B: <i>Guduchi Ghana</i> prepared by soxhlet method (n=16) (Dose: 250 mg twice daily in both Gps.)	33	28 FU: 30	Moderate 47.05% in Gp A & 25.00% in Gp B. Mild 52.94% in Gp A & 62.50% in Gp B. Unchanged 12.50% in Gp B.
Agrawal S <i>et al.</i> <sup>[46]</sup> (MD, 2015)	Gp A: SBGC 1 <sup>[47]</sup> ( <i>Swarasa Bhavita Guduchi Churna- Swarasa</i> <sup>[48]</sup> prepared with less duration of immersion) (n=21) Gp B: SBGC 2 ( <i>Swarasa</i> prepared with more duration of immersion) (n=22) 2g tablets TID before meal for both Gps with Luke warm water.	43	60 FU: 30	In Gp A & B respectively, 4.76% & 9.09% marked, 19.05% & 31.82% moderate, 66.67% & 59.05% mild while 4.76% unchanged in both.

Mitra S <i>et al.</i> <sup>[49]</sup> (PhD, 2007)	Gp A: <i>Gandhaka Rasayana</i> <sup>[50]</sup> <i>Bhavana</i> given with <i>Kwatha Dravya's Arka</i> (distillate) Gp B: <i>Gandhaka Rasayana Bhavana</i> given with <i>Kwatha</i> Gp C: Placebo control Gp (roasted <i>Suzi</i> ) <i>Tila Taila</i> (Ext) for all Gps	34	30	In Gp A, B & C respectively, cured 11.70%, 14.70%, & 0%, marked 38.23%, 5.88% & 0%, moderate 29.10%, 26.47% & 0%, mild 11.70%, 20.58% & 2.94%, unchanged: 8.82 %, 32.35 % & 97.05%.
<i>Mukhadushika</i> (Acne)				
Rameshchandra Arun <i>et al.</i> <sup>[51]</sup> (MD, 2002)	Gp A: <i>Shankha Bhasma</i> 250 mg with luke warm water thrice a day orally (n=8), Gp B: <i>Yauvanpidikahara lepa</i> QS with milk for local application (n=8), Gp C: <i>Shankha Bhasma</i> orally & <i>Yauvanpidikahara lepa</i> locally (n=14).	30	35	In Gp A Cured 21.43% & marked 14.70%. In Gp B & Gp C respectively, moderate 50% & 87.50% & mild 50% & 12.50%
Amrutiya A <i>et al.</i> <sup>[52]</sup> (MD, 2009)	Gp A : <i>Kumkumadi ghrita</i> <sup>[53]</sup> prepared by Keshara (n=24), Gp B : <i>Kumkumadi ghrita</i> prepared by <i>Nagakesara</i> (n=25), (to wash face by luke warm water & do <i>Abhyanga</i> (Massage) with for 15 minutes	49	30	In Gp A & B respectively, marked 12% & 15.38%, Moderate 44% & 26.92%, Mild 16% & 23.07%. unchanged 28% & 34.61% Respectively.
<i>Shvitra</i> (Vitiligo)				
Agraval U <i>et al.</i> <sup>[54]</sup> (MD, 1990)	Gp A: <i>Shvitraghna yoga</i> A (20 herbal drugs indicated for <i>Shvitra</i> ) (n=10), Gp B: <i>Shvitraghna yoga</i> B (20 herbs along with <i>Rassindura</i> ) (n=10). Dose: Orally 2 gm for adult & 1 gm for child thrice a day with water. Ext <i>Shvitraghna Taila</i> in both.	20	135	In Gp A & B respectively, 30% & 50% cured, 20% & 40% marked, while 30% mild in gp A & 10% unchanged in Gp B.
Zankhana G <i>et al.</i> <sup>[55]</sup> (PhD, 2006)	Gp A: Vit-8 <i>lepa</i> QS Ext (n=31) Gp B: Vit -8 oil QS Ext (n=31) Gp C: <i>Khadira</i> 1gm, <i>Amalaki</i> 1gm & <i>Bakuchi</i> 500mg Int. twice a day with water. <i>Bakuchi</i> Oil QS Ext. (n=32) ( <i>lepa</i> & Oil was applied once followed by rising sun exposure for 4 to 5 min.)	94	90 FU: 60	In Gp A, B & C respectively, marked 3.23%, 3.23% & 0.00%, moderate 29.03%, 6.45% & 34.38%, mild 64.52%, 61.29% & 53.13%, unchanged 3.23 %, 29.03 % & 12.50%.
Goyal M <i>et al.</i> <sup>[56]</sup> (MD, 2008)	Gp A: <i>Karpanpatru (KP) Taila</i> ( <i>Gomutra</i> ) (n=12) Gp B: <i>KP Taila</i> ( <i>Kanji</i> ) (n=12) Gp C: <i>KP Taila</i> ( <i>Takra</i> ) (n=12). QS for LA once a day followed by exposure to Sunlight for 5 minutes in the morning.	36	60 FU: 30	In Gp A, B & C respectively, marked 00%, 16.66% & 8.33%, moderate 8.33%, 8.33% & 16.66%, mild 58.66%, 50% & 33.33%, unchanged 33.33 %, 25 % & 41.66%.



Jadav HR <i>et al.</i> <sup>[57]</sup> (MD, 2014)	Gp A (n = 25) <i>Apamarga Kshara Yoga Lepa</i> <sup>[58]</sup> . Gp B (n = 25) <i>Apamarga Kshara Yoga</i> ointment. Int. in both Gps, 3 g of <i>Rasayana churna</i> <sup>[59]</sup> along with <i>Madhu &amp; Ghrita</i> twice a day.	50	60 FU: 30	In Gp A & B respectively, 52% moderate in each, 32% & 36% mild & 16% & 12% unchanged.
Shingadiya RK <i>et al.</i> <sup>[60]</sup> (MD, 2015)	Gp A: <i>Savarnakara Lepa</i> <sup>[61]</sup> for LA (n=24), Gp B: <i>Savarnakara</i> ointment for LA (n=28). In both Gps Int. <i>Kanakabindvarishta</i> <sup>[62]</sup> 20ml with equal quantity of water twice a day.	52	60 FU: 30	In Gp A & B respectively, 20.83% & 17.86% moderate, 75% & 60.71% mild & 4.17% & 14.29% unchanged.

Gp= Group, FU: Follow Up, Ext= Externally, Int= Internally, LA= Local application, QS= Quantity sufficient

**Table 2: Studies showing comparison between classical and contemporary modified formulations**

Study	Name of formulation	Classical form	Modified form	Better results
Mehta N <i>et al.</i>	Rasa karpura drava	<i>Drava</i>	Jel	-
Thaker A V <i>et al.</i>	<i>Kampillaka Malahara</i>	<i>Siktha Taila</i>	Vaselline	Classical
Druve K <i>et al.</i>	<i>Kanakabindvarishta</i>	<i>Dhataki Pushpa</i>	Yeast	Classical
Umrethiya B <i>et al.</i>	<i>Guduchi Ghana</i>	<i>Kwatha</i>	Soxhlet method	Classical
Mitra S <i>et al.</i>	<i>Gandhaka Rasayana</i>	<i>Kwatha</i>	Distillate	Almost same
Tank ZG <i>et al.</i>	<i>Vit-8 Yoga</i>	<i>Lepa</i>	Oil	Almost same
Jadav HR <i>et al.</i>	<i>Apamarga Kshara Yoga</i>	<i>Lepa</i>	Ointment	Almost same
Shingadiya RK <i>et al.</i>	<i>Savarnakara Yoga</i>	<i>Lepa</i>	Ointment	Almost same

**Table 3: Studies showing pharmaceutical modifications of the classical formulations**

Study	Name of formulation	Modified part	Group A	Group B	Group C	Better results
Anadakat HA <i>et al.</i>	<i>Rasamanikyam</i>	Method	<i>sarava samputa</i>	<i>Abhraka Patra</i>	<i>Kupi pakva</i>	Gp B
Zala U <i>et al.</i>	<i>Panchatikta Ghrita</i>	Method	<i>Murchhit a</i>	<i>Avartita</i>	-	Gp B
Vaghmashi R <i>et al.</i>	<i>Guduchi Sneha</i>	Method & Media	<i>Taila</i>	<i>Ghrita</i>	-	Gp A
Yadav P <i>et al.</i>	<i>Gandhaka</i>	<i>Shodhana Media</i>	<i>Gomutra</i>	<i>Bhringraja</i>	-	Gp A
Mitra S <i>et al.</i>	<i>Gandhaka Rasayana</i>	Media	<i>Kwatha</i>	<i>Distillate</i>	-	Almost same

Goyal M <i>et al.</i>	<i>Karpanpatru Taila</i>	Media	<i>Gomutra</i>	<i>Kanji</i>	<i>Takra</i>	Gp B
Thaker H <i>et al.</i>	<i>Gandhaka druti</i>	<i>Anupana Media</i>	<i>Nagavalli patra Swarasa</i>	<i>Batsa Swarasa</i>	-	Gp B
Shriman narayan K <i>et al.</i>	<i>Rasa Manikya</i>	Dose	125 mg/ day	250 mg/ day	-	Almost same
Agrawal S <i>et al.</i>	<i>Guduchi churnakriya</i>	Time duration	1 hour	12 hours	-	Gp B
Swayam Prakashma K <i>et al.</i>	<i>Rasasindoora</i>	Time duration	168 hours	6 hours	-	Gp A
Dhruve K <i>et al.</i>	<i>Khadirarista</i>	Ingredient	Sugar	Jiggery	-	Gp B
Amrutiya A <i>et al.</i>	<i>Kumkumadi ghruta</i>	Ingredient	<i>Keshara</i>	<i>Nagkeshara</i>	-	Almost same

**Table 4: Assessment criteria included in the studies**

Disease	Main symptoms	Special scores
<i>Kshudra kushtha</i> (common skin diseases)	<b>Vatika:</b> <i>Rukshta</i> (Dryness), <i>Shoola</i> (Pain), <i>Shyava</i> (blackish brown), <i>Aruna</i> (Reddish) <i>Khara</i> (Abrasive) <b>Paitika:</b> <i>Daha</i> (Burning), <i>Raga</i> (Redness), <i>Paristrava</i> (Discharge), <i>Paka</i> (Swelling), <i>Kleda</i> (Sticking) <b>Shleshmika:</b> <i>Kandu</i> (Itching), <i>Utsedha</i> (Elevation), <i>Shveta</i> (Whitening), <i>Sheeta</i> (Cold in touch)	Not found
<i>Vicharchika</i> (Eczema)	Main Symptoms: <i>Kandu</i> , <i>Pidika</i> (Papillae), <i>Shyava</i> , <i>Srava</i> (Discharge) Associate symptoms: <i>Vaivarnya</i> (Discoloration), <i>Shoola</i> , <i>Daha</i> , <i>Matsyashakalopamam</i> (Scaling), <i>Avadarana</i> (Crack), <i>Rukshata</i>	Not found
<i>Ekakushtha</i> (Psoriasis)	Main Symptoms: <i>Aswedanam</i> (Anhydrosis), <i>Mahavastu</i> (Extent of lesion), <i>Matsyashakalopamam</i> (Scaling) Associate symptoms: <i>Rukshata</i> , <i>Daha</i> , <i>Srava</i> , <i>Unnati</i> , <i>Kandu</i>	PASI score, Candle grease sign, Auspitz sign, Koebner phenomena
<i>Mukhadushika</i> (Acne)	Number and area of papules, Discoloration, Itching, burning, discharge	Not found
<i>Shvitra</i> (Vitiligo)	Main Symptoms: Area, size, colour and number of the patches Associate symptoms: <i>Mandalotpatti</i> (Circular skin lesion), <i>Rukshata</i> , <i>Saparidaha</i> , <i>Bahalatva</i> (Thickening of skin), <i>Kandu</i>	VASI score, Body surface percentage chart, Candle grease sign, Auspitz sign, Koebner phenomena



**Table 5: Criteria for assessment of overall effect of therapy**

<b>Percentage (%)</b>	<b>Effect of therapy</b>
0 – 24	No change
25 – 49	Mild improvement
50 – 74	Moderate improvement
75 – 99	Marked improvement
100	Cured