

Health Problems Faced by Women through House Dust Mites (HDM) and its Management through Herbal Plant Product Component

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ABSTRACT Women are the pivot of family. They do all domestic and social tasks for the family, as well as work full time. In fulfilling all these responsibilities, working women do not get proper time for household cleaning like non-working women. This improper cleaning practices with suitable environmental conditions leads to house dust mites in home. The present paper aims to study the harmful effects of house dust mites on women and its management through herbal product components. House dust mites are tiny microorganisms that cannot be seen with naked eyes. They hide in the household settled dust and create various allergic diseases in human beings. In the study, house dust mites were observed in the four different areas of house of different locations in Udaipur district. Most of the house dust mites were found in the living area. Findings highlighted that working women were more affected through house dust mites than non-working women. The common complications that faced by the women were asthma, skin rashes, wheezing, coughing, fatigue, headache etc. So, in the present investigation an attempt has been made to get rid from these harmful house dust mites. Non-conventional plant product components of various local herbs were developed that are non-toxic and environment friendly. From these local herbs *Sahjan*, *Satyanashi* and *Castor* were found most effective in controlling house dust mites.

INTRODUCTION

The Chinese saying goes that women hold up half the sky. Women have been an equal economic partner to men though mostly in an invisible capacity while fulfilling a multiplicity of other roles both within and outside the four walls of the households. Yet their contribution remains ignored, overlooked, underestimated and often unaccounted. The Human Development Report, 1995 has drawn attention to the persistence of severe gender disparities in human development. A major index of neglect the report points out is that many of women's economic contributions are grossly undervalued or not valued at all. It estimates the value of such non-monetised, invisible contribution of women to be around 11 trillion US dollars or almost 50 per cent of global output (Athreya and Chundakath 1995). The dual role of women within and outside the family has created varied problems for the women.

The rise in women's paid employment has challenged this division of men's and women's lives. The most affected counterpart is the women. She has to do both inside and outside work. This dual responsibility adversely affects the lives of women. Cleaning the house is a necessary part of women life. Cleaning is con-

sidered as free from dirt or impurities that can be achieved through proper care and attention. But working women do not get enough time to clean the house which leads to dust accumulation in the house. Dust accumulation is a natural phenomenon that occurs by the everyday's sweeping of room or making of bed. Dust accumulation has serious consequences for human beings and the environment. Accumulation process is often accompanied by heterogeneous assemblage of a variety of products of plant and animal origin, an appreciable portion of which constituted by the house dust mites (Lakshmi and Haq 1999).

House dust mites get name from its habitat – household dust. Unlike some other kind of mites, house dust mites are not parasites on living plants, animals and humans. House dust mites primarily live on dead skin cells, which are commonly called dander, which shed regularly from humans and their animal pets (Barbogg 2003). Carpet, mattress and upholstered furniture or the places near the human rest provide suitable conditions for the presence of house dust mites in indoor household environment (Mahmic et al. 1998; Warner et al. 1999; Fernandez and Caldas 2002; David 2007). More recently, causal links have been proven between immunity to house dust mites and allergic disorders, including asthma,

rhinitis, dermatitis and conjunctivitis (Hewitt et al. 1995).

Hence, this paper has been undertaken with the following objectives:

- To study the household cleaning pattern followed by working and non- working women.
- To find out the health hazards faced by working and non working women from HDMs.
- To test the bio efficacy of herbal plant product component in controlling house dust mites.

MATERIALS AND METHODS

Data were collected in the months of summer (rainy) and winter season. Data collection started in the month of November 2008 to September 2009. The study was conducted in three phases in the city of Udaipur. In the first phase, a survey was conducted on the sample of 120 women which were selected purposively on the basis of their work status as working and non- working women (60 each). Information was gathered regarding their family background, cleaning pattern and health problems faced by the respondents. Settled house dust samples were also collected from four different rooms of the households viz., living, dining, bed room and kitchen. Two grams of settled dust was collected through vacuum cleaner from carpet, sofa, TV cabinets, and curtains, below bed, bed surface, below and above the almirah, floor area below furniture, kitchen cabinets, sink and refrigerator. After collecting the settle dust samples, HDMs were counted under binocular microscope in the laboratory. On the basis of mean $\pm$ SD of house dust mites', households were divided into three categories as low (L), moderate (M) and high (H).

In the second phase, 3 households with high concentration of HDMs were selected from the sample irrespective of the women's work status and treated with chosen 8 different local plant product components viz., *sahjan*, *satyanashi*, *dhatuta*, custard apple, castor, *timru*, *babool* and *mahandi* at different levels of concentration (3, 5, 7 per cent) to test its efficacy on HDMs mortality rate. The three most effective plant product components were selected for field experiments in laboratory. The procedure for making partially purified plant product component

given by Sharma and Simlot (1971) was followed.

In the third phase, three most effective plant product components (at 5 percent level) were applied in different areas of 30 working and non-working households', that is, 10 households for each plant product component. Plant product components were sprayed in living, dining, bedroom and kitchen area furnishings, furniture, flooring, drawers and cabinets of the respondents' houses. The rooms were kept closed for four hours so that the efficacy of the PPC may not lessen and it will be more effective on HDMs. Dust samples were collected from different areas of these rooms on 1st, 15th and 28th day with a portable handy vacuum cleaner.

RESULTS AND DISCUSSION

Family Background Information

Respondents' family background information was collected to get knowledge about respondents' socio-economic status.

Religion: Religion is an integral part of the entire culture and permeates in every aspect of life. Religion plays an important role in the daily routine, living habits towards health and hygiene of the average Indian. Data in the Table 1 shows that majority of the women (83.33 per cent) belonged to Hindu religion. A meagre (3.33 per cent) percentage of women were Sikh. Interestingly cent percent of Hindu working women belonged to high house dust mite (HDM) category.

Age: With the advancement of age respondents' efficiency for housekeeping decreases, at the same time they have greater risk from allergic diseases, mainly from HDMs (Bency et al. 2003; Hart et al. 1998).

The data explicitly shows that the average age of respondents was 45.22 years (SD=8.85). Working respondents (44.57 years) had lower than the average age as compared to non-working women. (45.27 years). Working women respondents of higher age belonged to moderate HDM category whereas non- working belong to high HDMs category.

Type of Family: Human being is a social animal live in family. It was found that most of the women respondents were living in joint families (60.83 per cent) than in nuclear families (39.16 per cent). Joint families were found to be higher among working women (61.90 per cent).

Size of Family: Size of family is a significant

Table 1: Distribution of respondents according to family background information

S. No.	Family background information N=120	Working women				Non- working women				Grand total
		Ln=11	Mn=44	Hn=8	TotalN=63	Ln=12	Mn=39	Hn=06	TotalN=57	
1	Religion									
	Hindu	81.80	81.80	100	84.10	83.30	79.50	100	82.50	83.33
	Sikh	9.10	2.30	0	3.20	0	5.10	0	3.50	3.33
	Jain	9.10	15.90	0	12.70	16.70	15.40	0	14.00	13.33
2	Age of the Respondent (in years)									
	Mean	44.63	45.27	40.62	44.57	41.91	45.76	55.16	45.94	45.22
	SD	8.54	9.21	8.78	9.04	8.06	7.24	12.59	8.67	8.85
4	Family Type									
	Joint	54.50	61.40	75.00	61.90	50.00	66.70	33.30	59.60	60.83
	Nuclear	45.50	38.60	25.00	38.10	50.00	33.30	66.70	40.40	39.16
5	Family Size (Number of Members)									
	Mean	6.18	5.18	5.25	5.36	5.25	5.46	5.00	5.36	5.36
	SD	1.60	1.43	1.58	1.50	1.35	1.44	1.09	1.38	1.44
6	Children Below 5 Years of Age (in percentage)									
	Child/ren below 5 yrs of age	18.20	34.10	25.00	30.20	0	0	0	0	15.83
	No child below 5 yrs of age	81.80	65.90	75.00	69.80	100	100	100	100	84.16
7	Female Adults in the Family (Number of Females)									
	Mean	2.27	3.06	3.25	2.95	3.00	3.38	2.66	3.22	3.08
	SD	0.64	1.35	1.16	1.26	1.41	1.06	0.51	1.11	1.19
8	Household Income (in Rupees)									
	Mean	5855000	512113.8	484500	521333	398333	453461	425000	438859	482158
	SD	212614	2539821	700988	237172	160501	219146	227486	206857	226173

factor which determines the cleanliness of the house. Large family members live in overcrowded multipurpose rooms which act as hindrance in proper household cleaning. This is the causative factor of settle dust leading to HDMs concentration in the house (Singh and Rao 2001). Average family members in families of working and non-working women were 5.36 members.

Children Below 5 Years of Age: The presence of small children in the family is associated with frequent cleaning of house. Small children drop food items on the floor and with the absence of proper cleaning, unhygienic conditions may develop leading to HDMs growth and hence they become the main victims of diseases through HDMs (Lewis et al. 1994; Nair et al. 2003). Total 15.83 percent of respondents had children below 5 years of age, out of which 30.20 per cent of working women had children below 5 years of the age.

Number of Female Adults: Women play crucial role in household sanitation and hygiene (Solanki 1990). Number of female adults present in a family reflects the attentiveness of indoor cleanliness. Average female adults in the families

were 3 members (SD= 1.09). Working women families had low average female adults (2.95 members) than non- working women (3.22 members).

Household Income: The overall household income determines the socio-economic status of the family. The total household income includes the annual income of the family members, that is, income of respondents', their husbands, son and daughter from primary and subsidiary occupations. The average household income was Rs 48,2158 (SD=22,6173). Working women households had higher average income (Rs 52,1333) as compared to non-working women (Rs 43,8859).

Time Spent in Work and in Household Cleaning

Work Time: Time spent in primary and secondary occupations determines respondents' quality of time devoted in household chores and other allied activities (Bhowmick 1971; Majumdar 1978). The daily average work time devoted by working and non- working women was 11.22 hours (SD=8.65). Data in the Table 2 revealed

Table 2: Distribution of respondents according to time spent in work and in household cleaning

S. No.	Time devoted	Working women				Non-working women				Grand total N=120
		Ln=11	Mn=44	Hn=08	TotalN=63	Ln=12	Mn=39	Hn=06	TotalN=57	
1	Daily Work Time (in hours)									
	Mean	12.36	10.81	12.87	15.22	7.58	5.89	6.00	.94	11.22
	SD	10.32	8.56	9.32	12.85	3.50	3.71	4.69	3.90	8.65
2	Household Cleaning Time Devoted (in hours)									
	Mean	1.25	1.73	1.11	1.77	2.85	3.20	0	2.97	2.87
	SD	1.44	1.58	0.28	1.47	1.89	2.56	0	1.37	1.48

that working women spent more than the average time (15.22 hours) on household chores and work. In high HDM category, working women spent more time (12.87 hours) on work.

Household Cleaning Time

House cleaning is an important factor in HDMs growth. The pattern of house cleaning practices varied in different households which includes sweeping, dusting, mopping etc. Time devoted by respondents in cleaning activities reflected their awareness towards sanitation and hygiene. The data shows that working women devote lesser time (1.77 hours) in household cleaning than non-working (2.97 hours). Those working women devoting lesser time (1.11 hours) in household cleaning were belonged to high HDMs category.

HDMs Symptoms

Different type of HDMs associated symptoms were faced by the respondents in the households

(Table 3). Breathlessness while dusting was the common symptom faced by 25 per cent of respondents specially while sweeping and mopping the floor (15 per cent). More than one-third of the respondents faced frequent ear infection (37.50 per cent) problem were belonged to high HDM category. Various other symptoms faced by the respondents were sleepy feeling (2.5 per cent), vomiting during cleaning of house (6.66 per cent), breathlessness while cleaning of cabinets and drawers (15 per cent) etc.

Complications from HDMs

Various complications were faced by the respondents while working in the households due to HDMs (See Table 4). Risk of wheezing also associated with HDMs allergens in the house (Jedrychowski et al. 2007). Wheezing is a high pitched whistling sound during breathing. Half of the working women faced wheezing problem during high humidity. Coughing was the commonest reason that may trigger through HDMs (Little 2003; Sharma 2009). Higher percent (45

Table 3: Distribution of respondents according to HDMs symptoms

S.No.	Symptoms	Working women				Non-working women				Grand total N=120
		Ln=11	Mn=44	Hn=08	Total N=63	Ln=12	Mn=39	Hn=06	TotalN=57	
1	Breathless during dusting	9.10	27.30	25.00	23.80	33.30	23.10	33.30	26.30	25
2	Uncomfortable doing heavy work	27.30	6.80	0	9.50	0	2.60	0	1.80	5.83
3	Breathless in climbing	0	11.40	0	7.90	8.30	7.70	0	7.00	7.50
4	Frequent ear infection	27.30	6.80	37.50	14.30	16.70	5.10	0	7.00	10.83
5	Feeling of sleepiness	0	2.30	0	1.60	8.30	2.60	0	3.50	2.50
6	Heavy head	0	6.80	12.50	6.30	0	7.70	33.30	8.80	7.50
7	Vomiting in cleaning of house	18.20	6.80	0	7.90	0	7.70	0	5.30	6.66
8	Dysentery most of the time	0	9.10	0	6.30	8.30	5.10	0	5.30	5.83
9	Red rashes throughout year	0	6.80	12.50	6.30	8.30	2.60	0	3.50	5.00
10	Red rash sometimes	0	4.50	0	3.20	0	17.90	16.70	14.00	8.33
11	Breathless while sweeping/ mopping	18.20	11.40	12.50	12.70	16.70	17.90	16.70	17.50	15.00

per cent) of women respondents were facing coughing problem seasonally and it was more among non working women (59.60 per cent). Near about one- third of the working women faced coughing problem seasonally belonged to moderate HDM category.

Shortness of breath is a complicated HDMs respiratory problem, occurs mostly in high humid conditions (Zock et al. 1994). Half of the women respondents faced shortness of breath problem seasonally. Half of the women faced shortness of breath with wheezing problem after rainfall (Table 4). House dust mites can cause respiratory problems when they wake up in the morning due to difficulty in respiration.

Half of the women woke up with respiratory symptoms during high humidity. More than half (54.00 per cent) of the working women faced this problem throughout the year. The symptoms and signs of an allergic reaction to dust mites are similar to common cold or hay fever (Andril 2009). Near about half of the respondents faced cold problem throughout the year. One- third of the working women faced common cold problem in seasonally belonged to high HDM category. Working women who were facing harshness of voice problem most of them (75 per cent) belonged to high HDM category. Rough or harsh sounding voice is caused by vocal abuse and allergy to substances like house dust mites and pollens.

Common fever and sweating problem was faced by more than half (52.50 per cent) of the respondents during high humidity. Apart this, itching was another problem faced by two-third (64.16 per cent) of the women in high humidity. Dirty skin becomes a perfect breeding ground for skin diseases like itching eczema etc. Moist body parts with perspiration give a preferable environment for the growth of tropical fungus and HDMs (Stella 1974). More than half of the working women (56 per cent) faced itching problem belonged to moderate HDM category. Cent percent working women that faced red rashes problem on skin belonged to high HDM category. Less than half of the respondents faced head ache problem (41.66 per cent) after rainfall. Fatigue was found common problem among 27 per cent of working women. When the surface of eyes is exposed to HDMs allergens an allergic reaction occurs which causes red, itchy and watery eyes. The problem was faced among more than half (52.50 per cent) of the respondents.

Cent per cent of working women faced this problem during high humidity belonged to high HDM category.

Severity of HDMs Complications

Severity of HDMs complications was measured on three point continuum as severe, mild and moderate. In the Table 5, it is shown that more than half (51.99 per cent) of the respondents had mild complications from HDMs

However, 28.33 per cent respondents had moderate and 20.00 per cent had severe complications from HDMs. These HDMs complications were more severe among working women (22.20 per cent) than non- working women (17.50 per cent). It was found that in moderately affected category of working women were also higher (31.70 per cent) than non-working women (24.60 per cent).

Testing of House Dust Mites Mortality Rate

On the basis of laboratory experiments three herbal seeds namely *satyanashi*, *sahjan* and *castor* were selected for further experimentation in houses. In houses plant product components were sprayed on various areas of furniture and furnishings. The experiments were conducted thrice on 1st, 15th and 28th days of plant product component application (Table 6).

1st Day After Application: Table 6 reveals that all the three treatments were found to be statically significant over control group at 1st day after application of herbal plant product component. *Satyanashi* (5 per cent) proved as a most effective treatment among other treatments. It gave 64.25 per cent reduction in HDMs population whereas castor and *sahjan* gave 60.36 and 58.32 per cent reduction in mite population, respectively.

15th Day After Application: All the treatments gave similar trends of results as in 1st day after application. In each, *satyanashi* (5 percent) again proved to be most effective treatment among other treatments. Castor (5 per cent) was found statistically significant over *sahjan* at same concentration.

28th Day After Application: The trend of result was found as similar as in 1st and 15th day after application of the treatments. Here also *satyanashi* was found superior over other treatments. All the three treatments gave less than 50 per cent mortality rate in the mite population.

Table 4: Distribution of respondents according to complications from HDMs

S.No.	Complications	Working women				Non- working women				Grand total N=120
		Ln=11	Mn=44	Hn=08	TotalN=63	Ln=12	Mn=39	Hn=06	TotalN=57	
1.	<i>Wheezing</i>									
	Throughout year	27.30	27.30	50.00	30.20	0	7.70	0	5.30	18.33
	After rainfall	36.40	18.20	0	19.00	16.70	25.60	0	21.10	20.00
	In high humidity	36.40	50.00	50.00	47.60	83.30	56.40	100.0	66.70	56.66
	Seasonally	0	4.50	0	3.20	0	10.30	0	7.00	0
2.	<i>Coughing</i>									
	Throughout year	18.20	6.80	0	7.90	16.70	15.40	0	14.00	10.83
	After rainfall	0	4.50	0	3.20	33.30	7.70	0	12.30	7.50
	In high humidity	9.10	2.30	0	3.20	16.70	2.60	33.30	8.80	5.83
	Seasonally	18.20	36.40	25.00	31.70	33.30	66.70	66.70	59.60	45
3.	<i>Shortness of Breath</i>									
	Throughout year	18.20	9.10	0	9.50	0	10.30	50.00	12.30	10.83
	After rainfall	0	6.80	0	4.80	8.30	15.40	0	12.30	8.33
	Seasonally	27.30	34.10	25.00	31.70	91.70	66.70	50.00	70.20	50.00
4.	<i>Shortness of Breath + Wheezing</i>									
	Throughout year	18.20	4.50	0	6.30	0	5.10	0	3.50	5.00
	After rainfall	9.10	40.90	25.00	33.30	75.00	69.20	50.00	68.40	50.00
	In high humidity	18.20	0	0	3.20	16.70	7.70	33.30	12.30	7.50
	Seasonally	0	4.50	0	3.20	8.30	10.30	16.70	10.50	6.66
5.	<i>Woke up with Respiratory Symptoms</i>									
	Throughout year	54.50	50.00	75.00	54.00	0	7.70	0	5.30	30.83
	After rainfall	18.20	4.50	0	6.30	0	5.10	0	3.50	5.00
	In high humidity	9.10	40.90	25.00	33.30	75.00	69.20	50.00	68.40	50.00
	Seasonally	18.20	0	0	3.20	16.70	7.70	33.30	12.30	7.50
6.	<i>Common Cold</i>									
	Throughout year	83.30	69.20	16.70	66.70	18.20	38.60	12.50	31.70	48.33
	After rainfall	8.30	2.60	16.70	5.30	9.10	4.50	12.50	6.30	5.83
	In high humidity	8.30	15.40	33.30	15.80	9.10	4.50	0	4.80	10.00
	Seasonally	0	5.10	33.30	7.00	9.10	2.30	0	3.20	5.00
7.	<i>Harshness of Voice</i>									
	After rainfall	72.70	54.50	75.00	60.30	0	12.80	0	8.80	35.83
	In high humidity	27.30	38.60	25.00	34.90	83.30	79.50	100.0	82.50	57.50
	Seasonally	0	6.80	0	0	16.70	7.70	0	8.80	6.66
8.	<i>Common Fever and Sweating</i>									
	Throughout year	54.50	50.00	75.00	54.00	0	7.70	0	5.30	30.83
	After rainfall	18.20	4.50	0	6.30	0	5.10	0	3.50	5.00
	In high humidity	27.30	38.60	12.50	33.30	91.70	64.10	100.0	73.70	52.50
	Seasonally	0	6.80	12.50	6.30	8.30	20.50	0	15.80	10.00
9.	<i>Itching</i>									
	Throughout year	27.30	13.60	25.00	17.50	8.30	10.30	0	8.80	13.33
	After rainfall	0	6.80	12.50	6.30	8.30	7.70	0	7.00	6.66
	In high humidity	45.50	56.80	25.00	50.80	83.30	74.40	100.0	78.90	64.16
10.	<i>Red Rashes on Skin</i>									
	Throughout year	8.30	10.30	0	8.80	18.20	6.80	0	7.90	8.33
	After rainfall	8.30	7.70	0	7.00	0	0	12.50	1.60	4.60
	In high humidity	83.30	74.40	100.0	78.90	27.30	43.20	12.50	36.50	56.66
11.	<i>Head Aches</i>									
	Throughout year	63.60	59.10	75.00	61.90	0	10.30	0	7.00	35.83
	After rainfall	18.20	29.50	12.50	25.40	41.70	61.50	83.30	59.60	41.66
	In high humidity	9.1	2.30	0	3.20	25.00	10.30	0	12.30	7.50
	Seasonally	9.10	2.30	12.50	4.80	8.30	5.10	0	5.30	5.00
12.	<i>Fatigue</i>									
	Throughout year	27.30	29.50	12.50	27.00	0	0	0	0	14.16
	After rainfall	0	6.80	0	4.80	83.30	71.80	83.30	75.40	38.33
	In high humidity	9.10	4.50	0	4.80	0	12.80	16.70	10.50	7.50
	Seasonally	9.10	4.50	12.50	6.30	16.70	7.70	0	8.80	7.50
13.	<i>Watery Eyes</i>									
	Throughout year	0	5.10	0	3.50	18.20	4.50	0	6.30	5.00
	After rainfall	8.30	15.40	0	12.30	0	4.50	0	3.20	7.50
	In high humidity	91.8	66.70	100.0	75.40	27.30	34.50	25.00	31.20	52.50
	Seasonally	0	5.10	0	3.50	0	2.30	0	1.60	2.50

Table 5: Distribution of respondents according to severity scale of complications from HDMs

S. No.	Severity	Working women				Non- working women				Grand total N=120
		Ln=11	Mn=44	Hn=08	TotalN=63	Ln=12	Mn=39	Hn=06	TotalN=57	
1	Severe	36.40	20.50	12.50	22.20	25.00	15.40	16.70	17.50	20.00
2	Moderate	18.20	36.40	25.00	31.70	33.30	23.10	16.70	24.60	28.33
3	Mild	45.50	43.20	62.50	46.00	41.70	61.50	66.70	57.90	51.99

Table 6: Bio-efficacy of herbal plant product component against house dust mites in houses

Treatments	PPC(ml/lit.)	% reduction in population at			Pooled mean
		1 DAA	15 DAA	28 DAA	
<i>Sahjan</i>	5%	49.79* (58.32)**	44.94* (49.89)**	20.54* (12.31)**	38.43* (38.63)**
<i>Satyanashi</i>	5%	53.28* (64.25)**	51.23* (60.78)**	31.15* (26.75)**	45.22* (50.38)**
Castor	5%	50.98* (60.36)**	48.41* (55.93)**	22.18* (14.25)**	40.53* (42.23)**
Control (untreated)	-	0.00	0.00	0.00	0.00
SEm $\pm$	-	0.28	0.33	0.24	0.20
C 5%)	-	0.82	0.96	0.69	0.57

* Arc sin value

** Percent value

Pooled Mean: On the basis of pooled mean the treatment by *satyanashi* (5 per cent) gave higher HDM mortality rate (50.38 per cent) reduction in the mite population as compared to other treatments. *Sahjan* was found less effective treatment than the treatment castor at the same level of concentration.

Hence, it can be inferred that that HDMs mortality rate was highest on first day followed by 15th and 28th day of plant product components' application. *Satyanashi* was found to be most effective NCPPCs followed by *sahjan* and castor. Highest mite mortality was found in living room furniture and furnishings on first day of PPCs application.

CONCLUSION

Thus, it can be summarized that house dust mites are the responsible for various types of diseases among working women like respiratory, skin and other allergic diseases. Improper sanitary and hygienic conditions were the causative factors for this. Various types of control measures such as physical or environmental and chemical are available but they are not used by the people due to their toxicity and harmful effects. Plant product component was the best option in controlling dust mites such as *sahjan*, *satyanashi* and castor etc. which showed highest dust mites mortality rate. These seeds are eco-friendly, locally available and cost effective too. Propagation of these control measures is

the need of the hour to enhance the quality of life of women workers.

RECOMMENDATIONS

Dust mites live in settle dust that causes severe health problems for inmates. This hazard becomes all the more grave in localities which are not properly designed and are bereft of modern amenities. Any excessive use of disinfectant (chemicals) may and do have grave side effects for the human beings. It is, therefore, of critical significance that alternative mediums are investigated which have the efficacy to kill the HDMs without causing any deleterious impact on human health. Our research has clearly vindicated the vitality and vibrancy of ancient and indigenous knowledge in this regard.

Indoor household experiments have showed bio efficacy of non-conventional plant product components in getting rid of the HDMs from furniture and furnishings. The task before the architects, house and town planners, policy makers, researchers and last but not the least the home makers is to take serious cognizance of the findings of this research and take consequent action to ameliorate the problems caused by house dust mites.

REFERENCES

- Andril 2009. Allergies. From < http://indoor-allergies.suite101.com/article.cfm/dealing_with_dust_mites > (Retrieved 12th April, 2009).

- Bency K, Thankappan B, Kumar B, Sreelakha T, Krishnan M 2003. A Study on the Air Pollution Related Human Diseases in Thiruvananthapuram City, Kerala. *Proceedings of the Third International Conference on Environment and Health* held in Chennai, India, Department of Geography, York University, pp. 15-22.
- Bhowmick KL 1971. A study on the management of HDMs development in homes in UK. *Journal of Immunology*, 17: 329-336.
- Hart B, Lonik M, Garder P 1998. Lifecycle and reproduction of house dust mites: Environmental factors influencing mite populations. *Allergy Copenhagen*, 48: 13-17.
- Jedrychowski, Wieslaw, Maugeri, Umberto, Zembala, Marek Perzanowski, Matthew S et al. 2007. International Journal of Occupational Medicine and Environmental Health, April 1, 2007, From <www.indiastudychannel.com, 2008> (Retrieved on April 01, 2008).
- Lewis R, Fortman R, Camann D 1994. Evaluation of methods for monitoring the exposure of small children to pesticides in the residential environment. *Environmental Contamination Toxicology*, 26: 24-46.
- Little A 2003. House Dust Mite (Dermato Phagoides Pteronyssinus). Internet link: <http://www.pan_uk.org/pestnews/homepest/dustmile.htm> (Retrieved June 2, 2009)
- Majumdar V 1978. Towards equality: The status of women in India. In: U Phadnis, I Malini 1980. (Eds.): *Women of the World- Illusion and Reality*. Delhi: Vikas Publishing House Pvt. Ltd., pp. 126-135.
- Niar M, Sikligar P 2003. Rural sanitation policies and strategies. *Kurukshetra*, 53: 58-62.
- Singh VD, Rao S 2001. Management of house dust mites with herbal extracts in Lamani households. *Journal of Human Ecology*, 12: 239-241.
- Solanki D 1990. *Role of Awareness Camps in Improving Knowledge and Practices of Rural Women in Environmental Sanitation*. M.Sc. Thesis, Unpublished. College of Home Science Udaipur.
- Sharma D 2009. Pollen fungus and house dust mites survey at the residence of 90 allergic patients in Greater Silchar Area of Assam, India. *Research Journal of Allergy*, 1: 1-11.
- Sharma KP, Simlot MM 1971. Pesticidal effect of timru, *Dispyros Cordifolia* Roxb. *Journal of Inland Fish Society*, 3: 57-62.
- Zock P, Jarvis D, Luczynka H 1994. Housing characteristics reported mold exposure and asthma in the European community respiratory health. *Journal Allergy and Clinical Immunology*, 110: 286-292.