

**PRAKARADI YOGAS AS RASAYANA AND ITS
IMMUNOMODULATORY PROPERTIES****Karuna S. Ratnaparkhi¹ and Rutuja S. Kale^{2*}**

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ABSTRACT

An entire section of the Materia Medica of Ayurveda is devoted to “Rasayana”, drugs reputed to enhance body resistance. Rasayana that age specific can be prescribed for particular age groups which can ultimately retard age specific conditions to extend and can promote longevity. Thus, a plan for Rasayana therapy right from birth shall be introduced in routine immunization schedule. The Rasayana herbs seem to operate through immunostimulant, immunoadjuvant, and immunosuppressant activities or by affecting the effector arm of the immune response. An authentic book of ayurveda called Arogya Raksha Kalpadruma, aims at achieving the same goal by taking care of

the base that is the phase in which various traditional ayurvedic formulations are used right from beginning of birth up to 12 years of age. For achieving disease free body this book has mentioned various PRAKARADI – YOGAS (Immunomodulatory measures) that are mentioned to be given specifically at starting phase of each growing month. This article highlights the role of prakara yogas and its immunomodulatory properties.

KEYWORDS:- Prakaradi yogas, Immunomodulatory, Rasayana, Immune system, botanical name, Immunoadjuvant, Immunosuppressant, Arogya Raksha Kalpadruma.

INTRODUCTION

Every system of medicine emphasizes on treating the disease but in ayurveda, treating a disease is always secondary rather, maintaining and presenting health which is the first objective of health care plans. To achieve this goal, daily regimen and seasonal regimen, code of conduct of diet and social behavior are mentioned in ayurveda along with implication of

Rasayana. Rasayana is one of the comprehensive disciplines of ayurveda, which comprises a specialized use of herbs, Herbo mineral formulations, food article and lifestyle along with self-discipline with social etiquette to achieve the optimum state of tissues and system of body so that there is the least effect of etiological factors on the body in the other words, it can be stated that Rasayana is a way to achieve homeostasis and thus retarding the process of aging phenomenon and prevention of diseases.

An entire section of the Materia Medica of Ayurveda is devoted to “Rasayana”, drugs reputed to enhance body resistance.^[1]

As per Ayurveda with advancing of age, there are certain organ, or system related changes and replenishing of these structures may postpone many age-related health issues and thus, Rasayana that age specific can be prescribed for particular age groups which can ultimately retard age specific conditions to extend and can promote longevity. Thus, a plan for Rasayana therapy right from birth shall be introduced in routine immunization schedule. Most of the drug formulations used in Prakaradi yogas have immunomodulatory properties.

Mechanism of action of Rasayana / Immunomodulators

It has been reported that the Rasayana are rejuvenators, nutritional supplements and possess strong antioxidant activities. The Rasayana herbs seem to operate through immunostimulant, immunoadjuvant, and immunosuppressant activities or by affecting the effector arm of the immune response.^[2]

An authentic book of ayurveda called Arogya Raksha Kalpadruma, a widely accepted Kerala's traditional ayurvedic pediatric care, classical text book also aims at achieving the same goal by taking care of the base that is the phase in which various traditional ayurvedic formulations are used right from beginning of birth up to 12 years of age. For achieving disease free body this book has mentioned various PRAKARADI – YOGAS (immunomodulatory measures) that are mentioned to be given specifically at starting phase of each growing month.^[3] According to this book due to vitiation of doshas many diseases are occurring to children very easily due to so many possible reasons so to reduce this prevalence rate of susceptible towards the disease these Prakaradi yogas are given. Most of the drug formulations used in Prakaradi yogas have immunomodulatory properties.

For new born child the drug Vacha is grinded in the juice of Tripadika, three drops of this preparation of juice is to be instilled over the anterior fontanelle of baby from the first day of birth up to 7 days, by doing this procedure digestive power is maintained correctly.

Acorus calamus (VACHA) is proved for anti inflammatory, hepatoprotective, immunomodulatory activity on human neutrophils^[4]

Age group	Drug formulation	Mode of administration	Duration	Time	Effect
Newborn (Jatamatra)	Vacha mixed with Tripadika ras	Sinchan on murdani	7 days	Morning	Dosha samyata and agni vridhhi

15 days old child after the 15 th day of birth panchanga bilva are collected and powdered well and then mixed with juice of Dhatri and this preparation is to be given internally for 7 days in the morning to prevent occurrence of disease.

Bilva have immunomodulatory, antimicrobial, anti-inflammatory, antipyretic, analgesic, hepatoprotective, cardioprotective, antioxidant, anticonvulsant, antidiarrheal properties hence used in Prakaradi yogas in early days of life.

Age group	Drug formulation	Mode of administration	Anupan	Duration	Time	Effect
Completed 15 days	Bilva panchang swaras	Oral	Dhatri swaras	7 days	Morning	Preventive aspect

1 month old child after one month drug as mentioned HINGU, MUSTA, VIDANG are powdered well and added with ghrita medicated with juice of TRAYANTI and it is to be given internally in the morning for 7 days.

Cyperus rotundus (MUSTA) contain potent components such as flavonoids that may potentially be useful for modulating the immune cell functions, provoking analgesic, anti inflammatory and anti oxidant effect.^[5]

AMALAKI, VIDANG have shown an increase in immunoglobuline levels in infant which is significantly greater than that of multivitamine used cases.^[6]

Age group	Drug formulation	Mode of administration	Anupan	Duration	Time	effect
Completed 1 month	MUSTA, HINGU, VIDANG	Oral	Trayanti sarpi	7 days	Morning	Disease prevention

3 month old child, after three months drugs like VYOSHA and powder of SARIVA is added with butter and advised to give internally for 7 days

Age group	Drug formulation	Mode of administration	Anupan	Duration	Time	effect
Completed 3 month	Vyosha and sariva churna	Oral	Navaneet	7 days	Morning	Disease prevention

Sariva possess anti-inflammatory, antipyretic, anti-oxidant, antiulcerogenic and an immune modulatory activity related to IgG secretion and ADA activity.^[7]

6 month old child after 6 months the baby is given power of musalikand and trikatu (pippali + marich + shunthi) mixed together well and added with honey and is given internally for 7 days in the morning to prevent disease

Age group	Drug formulation	Mode of administration	Anupan	Duration	Time	effect
Completed 6 month	Musalikanda and trikatu churna	Oral	Madhu	7 days	Morning	Disease prevention

Trikatu compound is an immunomodulatory and anti inflammatory agent with reference to cell mediated immune responses.^[8]

Dhatri (*Emblica officinalis*) and Musta (*Cyperus rotundus*) have an immunomodulatory effect through its antioxidant and antimicrobial properties.^[9]

Piper nigrum extract exert immunomodulatory roles and anti anti cancer effect this can promote healthy immune system.^[10]

Punica granatum have an immunomodulatory activity confirm by stimulation of cell mediated response.^[11]

The potential immunomodulatory effect of *N.sativa* (Jeerak) investigated.^[12]

At 1 year: Each month for 7 days

1st month-(Dhātri+Musta) + Vyosha + Madhu

2nd month - (Dhātri + Musta) + mixed with Ghrita

3rd month - (Dhatri + Musta) in sugar and warm water

4th month - (Dhatri + Musta) with sugar and honey

5th month - (Dhatri + Musta) with Panchakola Churna and Ghrita

6th month - (Dhātri + Musta) with Jeeraka and Pippali powder and honey

7th month - (Dhātri + Musta) with Vyosha + Dadima + Mastu

8th month - (Dhātri + Musta) with Granthika Mula +Kutaja processed in Ghrita

9th month - (Dhātri + Musta) with Vidanga + Pippali +honey

10th month - (Dhatri + Musta) Jiraka + Vyosha + sugar

11th month - (Dhātri + Musta) with goat milk

12th month (Dhātri + Musta) with sugar + Jeeraka powder + cow milk

Only the mixing substance changes each month

3rd year: All the medicines should be given empty stomach for 7 days of each month depending upon weight. Ghee and sugar in equal quantity of medicine

1st month - Guduchi, Pippali, Vacha.

2nd month - Vyosha, Yashti, Vacha, Saindhava, Abhaya.

3rd month Vidanga, Musta, Ela, Vacha, Shunthi, Pippali.

4th month Sariba, Vyosha, Vacha, Jiraka, Kaisiki (Māśīkka).

5 month-Dadima, Musta, Vacha, Dhanyaka, Pippali.

6th month- Punarnava, Bhūnimba, Vacha, Tvacha.

7th month- Mashaparni, Musta, Bimbi Root, Pippali, Vaca

8 month-Dronapushpa, Musta, Vacha, Palasa Tvak.

9th month-Brahmi, Musta, Vacha, Kutaja, Pippali

10th month Malatipushpa, Vacha, Jiraka, Māyōphala.

11th month - Shami Patra, Jiraka, Chitraka, Vacha, Pippali.

12 month- Musta, Trikatu, Dadima, Amalaki, Vidanga, Talisapatra, Chitraka, Ajagandha, Abhaya, Vacha.

5th year: Same as above but substitute Vacha with Pushkaramula.

8th year: Add Shankhapushpi root + medicines of 5th year-mix powder with ghrita and honey.

10th year: Every month give Ghrita made with following herbs for 7 days.

1st month - Abhaya, Vyosha, Saindhava, Vacha, Talisa Patra, Brahmi.

2nd month Vidanga, Amalaki, Vyosha, Patha, . Dādima, Chitrakaka, Mandukaparni Svarasa.

3rd month - Jiraka, Vyosa, Saindhava, Vacha, Musta, Pushkaramula in Vetasāmla Rasa.

4th month Jivaniya Gana Musta, Agnimantha, Chitraka, Granthika in goats milk.

5th month Draksha, Punarnava, Patha, Musta, Hapusha Mūla, Katphala, Dadima in goat milk.

6th month-Sarivādi Ghritam in goat milk.

7th month Nagarādi Ghritam, Kutaja, Musta, Bilva Panchanga in hot water.

8th month Pippalyadi Ghritam with Dadhi Mastu after making the ghee it has to be filtered into a vessel containing Jiraka and Sita (rock sugar).

9th month Bilvādi Ghritam / Another alternative Patha, Drona Pushpi, Musta in Mastu - make a ghee of that herbal paste.

10th month - Trayamānādi Ghritam.

11th month - Dadimadi Ghritam, Ghritam and Mastu in equal quantity.

12th month Kashaya Patha, Kutaja, Bhunimba, Dhanyaka; Kalka - Vidanga, Palasa Tvak, Nisa Dvaya, Punarnva, Vyosha, Dipyaka, Duralabha, Yashti - make the ghee - administer with honey.

13th year:

1st month - Durva, Vacha +Sita, Grita, honey.

2nd month Brahmi, Manduka Parni, Samivalka, Bhṛngamalaka, Magadhi, Asthisrnkhala, Indulekha (Bakuci), Bhunimba, Sariva).

List of drugs mentioned in prakara yoga chapter with their sanskrit name, botanical name:-

Sanskrit name	Botanical name
Vacha	Acorus calamus L
Tripadika	Adiantum lunulatum L.
Bilva	Aegle marmelos (Linn.) Correa ex Roxb.
Dhatri/Amalaki	Emblica officinalis Gaertn.
Musta/Ambhoda/Abda	Cyperus rotundus L.
Hingu	Ferula asafoetida L.
Vidanga/Vella	Embelica ribes Burn F.
Trayanti/Trayamana.	Scindapsus officinalis Scott.
Sunthi/Nagara	Zingiber officinale Roxb. Piper nigrum
Maricha	Linn.
Pippali/Krishna/Chapala	Piper longum L.
Chavya Chitraka/Agni	Piper chaba HUNTER

Jeeraka	Plumbago zeylanica L.
Dadima	Carumcarvi L.
Kalinga/Kutaja	Punica granatum Linn.
Guduchi	Holarrhenaanti dysentrica Wall.
Yastimadhu	Tinospora cordifolia (Wild) Meirs.
Haritaki	Glycyrrhiza glabra L.
Vibhitaki	Terminalia chebula Retz.
Amalaki	Terminaliabellerica (Gaertn.) Roxb.
Ela	Emblica officinalis
Kaisiki	Elettaria cardomomum (L) Maton
Dhanyaka	Quercus infectoria OLIV.
Vruschiva/Varshabhu	Coriandrum sativum Linn.
Bhunimba	Boerhavia diffusa Linn.
Supyaparni	Swertia chirata Buch. Ham
Ruddhi	Teramnus labialis var. mollis
Dronapushpi/Vaikundapushpa	Dioscorea bulbifera Linn.
Dwijataru/Palasha	Leucasa spera (Willd.) Link
Samipatra	Bute monosperma
Pashugandha	Mimosa pudica L.
Talisapatra	Nelumbo nuciferaGaertn.
Sankhapushpi/Anantha/Gopica	Abies webbianaLindl.
Patha	Hemides musindicus (L.) SCHULT.
Dipyaka/Ajamoda	Cyclea peltata
Vetasamla	Ptychoti sajowan DC.
Draksha	Rumex vesicarius L.
Habusha	Vitis vinifera L.
Jayanthi	Juniperus communis Linn.
Katphala	Premna integrifolia Linn.
Ushira	Myricanagi Thumb.
Surahwaya/Devadaru	Pseudoraphisspinesceus (R.Br.) Vikery
Bruhati	Cedrus deodara (Roxb.) Loud.
Amshumati	Solanum nigrum Linn.
Tikta	Desmodiumgangeticum DC.
Ambu	Solanum anguivi Lam.
Nalada	Vallisneriaspiralis Linn. Vetiveriazi
Arka	zanioides (Linn.) Nash.
Shigru	Calotropis gigantea
Samivalka	Moringa oleifera Lam.
Malatimukula	Prosopis spicigera
Utpala	Jasminum gradiflorum Linn
Nirgundi	Nymphaea stellata Wild
Ativisha	Vitex nirgundo
	Aconitum hetrophyllum wall

Jivanti	Holostem maadakodien Schultes.
Nisha	Curcuma linga Linn.
Munda	Centellaa siatica Linn.
Bhrunga/Bhrungaraja	Eclipta alba (Linn.) Linn
Vishala	Citrullus colocynthis Schrad. Cissus
Vajravalli	quandrangularis Linn.
Brahmi	Bacopa monnieri
Kakoli/Vira	Roscoea procera Wall.
Kshirakakoli	Lilium polphyllum D. Don
Jeevaka	Microstylis wallichii Lindl syn.
Rishabhaka	Microstylis muscifera Ridley
Medha	Polygonatum verticillatum (L.) All. syn.
Mahamedha	Polygonatum cirrhifolium (Wall.) Royle
Mudgaparni	Phaseolus trilobus Ait.
Mashaparni	Teramus labialis Spreng
Jivanthi	Leptadenia reticulate W & A
Madhuka	Glycyrrhiza glabra Linn.

DISCUSSION

As early infancy is a Kapha predominant stage and agni is crucial basis of ailment in infancy. The presence of rasayana drugs in combination pacify mild vata kapha and kapha kshya that might have been formed during deepan pachana process and leads to the formation of superior quality dhatus. Due to presence of rasayana drugs the formulation directly increases the “yuktikrita bala” so far, several clinical trials have been conducted on prakarayoga in children of different age group and their efficacy have been proved beyond doubt.^[13,14]

Prakara yogas are deepan, pachan, krimighna, tridosahara, medhya, shoolahara, kushtaghna, balya, ayushya, strotoshodhana, rasayana, anulomana and vyadhihar. Moreover, the ghee preparations mentioned from tenth to twelfth year substantiate the fact that the children of that age group are more to diseases due to vitiated pitta and vata and ghee is the ideal form of medication since it is going to pacify pitta and vata doshas. The same ghee preparations aids in brain stimulation, providing strength and disease curing.

Pharmacological studies showing the immunomodulatory effect of the various constituents of prakara yogas

Several pharmacological studies have been so far conducted on different ingredients of Prakara yoga such as Dhatri (*Emblica officinalis*)^[15-20] and Musta (*Cyperus rotundus*)^[21-22] have an immunomodulatory effect through its antioxidant and antimicrobial properties

Piper nigrum extract exert immunomodulatory roles and anti anti cancer effect this can promote healthy immune system.^[23]

Punica granatum have an immunomodulatory activity confirm by stimulation of cell mediated response.^[24]

The potential immunomodulatory effect of N.sativa (Jeerak) investigated.^[25]

Amshumati [Desmodium gaggeticum DC]^[26]Arka [Calotropis gigantea]^[27]

Bhrunga/bhrungaraja[Eclipta alba]^[28]Aegle marmelos [Linn],^[29] Bacopa monnieri,^[30-31] Solanum nigrum linn,^[32] Plumbago zeylanica l,^[33-35] Coriandrum sativum Linn,^[36] Leucas aspera (wild)link,^[37] Tinospora cordifolia (wild) Meirs,^[38] Terminalia chebula retz,^[39-52] Premna intergrifolia linn,^[53] Carum carvi Linn,^[54] Piper longum L,^[55] Centella asiaatica Linn.^[56-61]

Cyperus rotundus L.^[62-63] Vitex nigrundo L,^[64] Nelumbo nucifera gaertn,^[65] Moringo oleifera Lam,^[66-67] Cedrus deodara (roxb) loud,^[68-69] Acorus calamus L. Boerhavia diffusa Linn,^[70] Embelia ribes burn, Citrullus colocynthis schrad,^[71] Terminalia bellerica (gaertn.)roxb,^[72] Glycyrrhiza glabra L.

CONCLUSION

The findings of all these studies indicates that Rasayana [Immunomodulator] has a definite role in the maintenance and preservation of health, and appropriate use of Rasayana can help to bring down the prevalence of many diseases, ultimately reducing health care burden. Time has come when more focus shall be done on preventive aspects of disease and thus the present policy of health care system shall deal with awareness among the mass about rasayana utility.The prakara yogas can be practiced as an effective preventive measure right from the birth of a child. Ayurvedic classics, the Prakara Yoga remain the sole authentic traditional age wise immunization schedule for children. Hence it can be concluded that Arogya Raksha Kalpadruma explaining about Prakaradi Yogas as immunomodulatory meure can be very fruitful to our future generation when given as per age and schedule.

REFERENCES

1. Thatte UM, Dahanukar SA. Rasayana Concept: Clues from immunomodulatory therapy. In: Upadhyay SN, editor. Immunomodulation. New Dehli: Narosa Publishing House, 1997; 41-148.
2. Chulet R, Pradhan P. A review on rasayana. Phcog Rev, 2010; 3(6): 229-34.
3. Dr. Lal Krishnan editor, Prakaradi Yoga, Arogya Raksha Kalpadrumah, Varanasi: Chaukhambha Sanskrit Series, 1, 3, 42: 392-398.
4. July International Research Journal of Pharmacy, 2015; 6(7): 450-452 DOI:10.7897/2230-8407.06792 doi:10.1186/1472-6882-13-28
5. Pharmacological, antioxidant, genotoxic studies and modulation of rat splenocyte functions by *Cyperus rotundus* extracts. BMC Complementary and Alternative Medicine 2013 13:28.<http://www.biomedcentral.com/1472-6882/13/193>
6. Immunomodulatory role of *Embllica officinalis* in arsenic induced oxidative damage and apoptosis in thymocytes of mice. DOI: 10.4103/0253-7613.25806
7. Trikatu, an herbal compound as immunomodulatory and anti-inflammatory agent in the treatment of rheumatoid arthritis - An experimental study <https://doi.org/10.1016/j.cellimm.2013.12.002>
8. Pharmaceutical Sciences, 2021; 27(1): 46-55. doi:10.34172/PS.2020.61 <https://ps.tbzmed.ac.ir/>
9. In vitro investigation of the potential immunomodulatory and anti-cancer activities of black pepper (*Piper nigrum*) and cardamom (*Elettaria cardamomum*) Amin F Majdalawieh et al. J Med Food, 2010.
10. December Journal of Ethnopharmacology, 2001; 78(1): 85-7. DOI:10.1016/S0378-8741(01)002872 Source PubMed. www.Plantsjournal.com
11. Antioxidant potential and health benefits of cumin Dr. Shabu A et al The effect of Prakara USHDyoga to prevent morbidity in children between 6 months and 1 year, Dept. of kaumarabhritya, Govt Ayurveda College, Trivandrum, 2012.
12. Dr Anu C Mathew et al The effect of Prakara yoga to prevent morbidity in children va" by between 1 and 1 1/2 years, Dept. of kaumarabhritya, Govt Ayurveda College, Trivandrum, 2013.
13. Srikumar R. Parthasarathy NJ and Immunomodulatory activity of triphala on neutrophil functions. Sheela DR: Biol Pharm Bull, 2005; 28(8): 1398-403.

14. Ganju L, Karan D, Chanda S, Srivastava KK, Sawhney RC and Selvamurthy W: Immunomodulatory effects of agents of plant origin. *Biomed Pharmacother*, 2003; 57(7): 296-300.
15. Nemmani KV, Jena GB, Dey CS, Kaul CL and Ramarao P: Cell proliferation and natural killer cell activity by polyherbal formulation, Immu-21 in mice. *Indian J Exp Biol*, 2002; 40(3): 282-7.
16. Sai RM, Neetu D, Yogesh B, Anju B, Dipti P, Pauline T, Sharma SK, Sarada SK, Ilavazhagan G, Kumar D and Selvamurthy W: Cyto-protective and immunomodulating properties of Amla (*Emblica officinalis*) on lymphocytes: an in-vitro study. *J. Ethnopharmacol*, 2002; 81(1): 5-10.
17. Singh MK, Yadav SS, Gupta V and Khattri S: Immunomodulatory role of *Emblica officinalis* in arsenic induce oxidative damage and apoptosis in thymocytes of mice. *BMC Complementary and Alternative Medicine*, 2013; 13: 193.
18. Suja RS, Nair AMC, Sujith S, Preethy J and Deepa AK: Evaluation of immunomodulatory potential of *Emblica officinalis* fruit pulp extract in mice. *Indian Journal of Animal Research*, 2009; 43(2): 103-106.
19. Punturee K, Wild CP, Kasinrerk W and Vinitketkumnue U: Immunomodulatory activities of *Centella asiatica*. and *Rhinacanthus nasutus* extracts. *Asian Pac J Cancer Prev*, 2005; 6(3): 396-400.
20. Siddiqui NA, Ali M and Singh S: Immunomodulatory effect of *Tinospora cordifolia* and *Centella asiatica* and its modulation on cyclophosphamide challenge. *Oriental Pharmacy and Experimental Medicine*, 2008; 8(4): 380-385.
21. In vitro investigation of the potential immunomodulatory and anti-cancer activities of black pepper (*Piper nigrum*) and cardamom (*Elettaria cardamomum*) Amin F Majdalawieh et al. *J Med Food*, 2010.
22. December *Journal of Ethnopharmacology*, 2001; 78(1): 85-7. DOI:10.1016/S0378-8741(01)00287-2 Source PubMed. www.Plantsjournal.com
23. Antioxidant potential and health benefits of cumin Mishra PK, Singh N, Ahmad G, Dube A and Maurya R: Glycolipids and other constituents from *Desmodium gangeticum* with antileishmanial and immunomodulatory activities. *Bioorg Med Chem Lett*, 2005; 15, 15(20): 4543-6.
24. Pardesi GS, Gadgoli C, Vaidya MD, Hasni HY and More BH: Immunomodulatory activity of *Calotropis gigantea* by cyclophosphamide induced myelosuppression. *Pharmacology online*, 2008; 2: 164-167.

25. Chokotia LS, Vashistha P, Sironiya RK and Matoli H. International Journal of Research and Development in Pharmacy and Life Sciences, 2013; 2(4): 499-502.
26. Patel P. Asdaq SMB: Immunomodulatory activity of methanolic fruit extract of *Aegle marmelos* in experimental animals. Saudi Pharmaceutical Journal, 2010; 18: 161-165.
27. Govinda HV, Asdaq SMB. Immunomodulatory Potential of Methanol Extract of *Aegle marmelos* in Animals. Indian J Pharm Sci, 2011; 73(2): 235-240.
28. Juvekar A, Juvekar M, Hule A and Wankhede S: In vitro and in vivo immunomodulatory activity evaluation of *Bacopa monniera*, Scrophulariaceae. *Planta Med*, 2009; 75: 41.
29. Jian L, Qingwang L, Tao F and Kun L: Aqueous extract of *Solanum nigrum* inhibit growth of cervical carcinoma (U14) viamodulating immune response of tumor bearing mice and inducing apoptosis of tumor cells. *Fitoterapia*, 2008; 79(7,8): 548-56.
30. Poosarla A, Athota RR: Immunosuppressive properties of aqueous extract of *Plumbago zeylanica* in Balb/c mice. *Journal of Medicinal Plants Research*, 2010; 4(20): 2138-2143.
31. Checker R, Sharma D, Sandur SK, Khanam S and Poduval TB: Anti-inflammatory effects of Plumbagin are mediated by inhibition of NF-kappaB activation in lymphocytes. Int Kuo YC: Seselin from *Plumbago Zeylanica* inhibits pytohemagglutinin (PHA)-stimulated cell proliferation in human *Immunopharmacol*, 2009; 9(7-8): 949-58.
32. Tsai WJ, Chen YC, Wu MH, Lin LC, Chuang KA, Chang SC and peripheral blood mononuclear cells. *J Ethnopharmacol*, 2008; 2, 119(1): 67-73.
33. Cherng JM, Chiang W and Chiang LC: Immunomodulatory activities of coomin vegetables and species of Umbelliferae and its related coumarins and flavonoids. *Food chemistry*, 2008; 106: 944-950.
34. Stalin S. Kumar PS: Immunostimulatory Effect of Aqueous Extract of *Leucas aspera* in Cyclophosphamide induced Immunosuppressive Mice. *International Journal of Pharm Tech Research*, 2013; 5(3): 910-914.
35. Bhalerao BM, Kasote DM, Nagarkar BE, Jagtap SD, Vishwakarma KS, Pawar PK and Maheshwari VK: Comparative analysis of radical scavenging and immunomodulatory activities of *Tinospora cordifolia* growing with different supporting trees. *Acta Biologica Szegediensis*, 2012; 56(1): 65-71.
36. Sharma U, Bala M, Kumar N, Singh B, Munshi RK and Bhalerao S: Immunomodulatory active compounds from *Tinosporacordifolia*. *J Ethnopharmacol*, 2012; 141: 918-26.
37. Kapil A. Sharma S: Immunopotentiating compounds fro *Tinospora cordifolia*. *J Ethnopharmacol*, 1997; 58: 89-95.

38. Jahfar M: Glycosyl composition of polysaccharide from *Tinospora cordifolia*. *Acta Pharm*, 2003; 53: 65-9.
39. Tripathi YB, Sharma M and Manickam M: Rubia 5 din, a new antioxidant from *Rubia cordifolia*. *Indian J Biochem Biophys*, 1997; 34: 302-6.
40. Bishayi B, Roychowdhury S, Ghosh S and Sengupta M: Hepatoprotective and immunomodulatory properties of *Tinospora cordifolia* in CCL₄ intoxicated mature albino rats. *J Toxicol Sci*, 2002; 27: 139-46.
41. Subramanian M, Chintalwar GJ and Chattopadhyay S: Antioxidant properties of a *Tinospora cordifolia* polysaccharide against iron-mediated lipid damage and gamma-ray induced protein damage. *Redox Rep*, 2002; 7: 137-43.
42. More P, Pai K: In vitro NADH-oxidase, NADPH-oxidase and myeloperoxidase activity of macrophages after *Tinospora cordifolia* (guduchi) treatment. *Immunopharmacol Immunotoxicol*, 2012; 34: 368-72.
43. Upadhyaya R, PR, Sharma V and Anita KV: Assessment of the multifaceted immunomodulatory potential of the aqueous extract of *Tinospora cordifolia*. *Res J Chem Sci*, 2011; 1: 71-9.
44. Sudhakaran DS, Sreekha P, Devasree LD, Preme Singh S and Michael RD: Immunostimulatory effect of *Tinospora cordifolia*. Miers leaf extract in *Oreochromis mossambicus*. *Indian J Exp Biol*, 2006; 44: 726-32.
45. Raghu R, Sharma D, Ramakrishnan R, Khanam S, Chintalwar GJ and Sainis KB: Molecular events in the activation of B cells and macrophages by a non-microbial TLR4 agonist, G1-4A from *Tinospora cordifolia*. *Immunol Lett*, 2009; 123: 60-71.
46. Koppada R, Norozian FM, Torbati D, Kalomiris S, Ramachandran C and Totapally BR: Physiological effects of a novel immune stimulator drug, (1,4)- α -D-glucan, in rats. *Basic Clin Pharmacol Toxicol*, 2009; 105: 217-21.
47. Manjrekara PM, Jolly CI and Narayanan S: Comparative studies of the immunomodulatory activity of *Tinospora cordifolia* and *Tinospora sinensis*. *Fitoterapia*, 2000; 71(3): 254-257.
48. Kalikar MV, Thawani VR, Varadpande UK, Sontakke SD, Singh RP and Khiyani RK: Immunomodulatory effect of *Tinospora cordifolia* extract in human immunodeficiency virus positive patients. *Indian J Pharmacol*, 2008; 40(3): 107-110.
49. Aher V, Wahi AK: Immunomodulatory activity of alcohol extracts of *Terminalia chebula* Retz combretaceae. *Tropical Journal of Pharmaceutical Research*, 2011; 10(5): 567-575.

50. Gokani RH, Lahiri SK, Santani DD and Shah MB: Evaluation of Immunomodulatory Activity of *Clerodendrum phlomidis* and *Premna integrifolia* Root. *International Journal of Pharmacology*, 2007; 3: 352-356.
51. Nema R, Khare S. Singh D. Jain P, Pradhan A and Gupta A: Green source: A power of nature to cure cancer. *International Journal of Phytotherapy*, 2012; 2(2): 111-116.
52. Sunila ES, Kuttan G: Immunomodulatory and antitumor activity of *Piper longum* Linn. and Piperine. *J. Ethnopharmacol*, 2004; 90: 339–346.
53. Mananvalan G, Singh J: Chemical and some pharmacological studies on leaves of *P. longum* Linn. *Indian J. Pharm.Sci*, 1979; 41: 190.
54. Tripathi DM, Gupta N, Laxmi V, Saxena KC and Aggarwal AK: Antigiardial and immunostimulatory effect of *Piper longum* on giardiasis due to *Giardia lamblia*. *Phyther Res*, 1999; 13(7): 561 563.
55. Devan P, Bani S, Suri KA, Satti NK, and Qa Immunomodulation exhibited by piperinic acid of *Piper L.*, through suppression of proinflammatory cytokine *Immunopharmacol*, 2007; 7(7): 889-899.
56. Sunila ES, Kuttan G: Immunomodulatory and antitumor activity. of fruits of *Piper longum L.* and piperine. *J Ethnopharmacol*, 2004; 90(2-21): 339-346.
57. Agarwal AK, Singh M and Gupta N: Management an immunomodulatory herbal drug 'Pippali Rasayana. *J Ethnopharmacol*, 1994; 44(3): 143-146.
58. Punturee K, Wild CP, Kasinrek W and Vinitketkumnun U: Immunomodulatory activities of *Centella asiatica* and *Rhinacanthus nasutus* extracts. *Asian Pac J Cancer Prev*, 2005; 6(3): 396-400.
59. Siddiqui NA, Ali M and Singh S: Immunomodulatory effect of *Tinospora cordifolia* and *Centella asiatica* and its modulation on cyclophosphamide challenge. *Oriental Pharmacy and Experimental Medicine*, 2008; 8(4): 380-385.
60. Aghwan SS, Al-Taci AFM: Immunomodulation of aqueous extract of *Cyperus rotundus* Linn against experimental infection with hydatid cysts in mice. *Iraqi Journal of Veterinary Sciences*, 2007; 21(1): 147-157.
61. Ladda PL, Magdum CS: *Vitex negundo* Linn.: Ethnobotany, Phytochemistry and Pharmacology- A Review. *International Journal of advances in Pharmacy, Biology and Chemistry*, 2012; 1(1): 111-120.
62. Sivagurunathan A, Innocent BX and Muthulakshmi S: Immunomodulatory Effect of Dietary *Nelumbo nucifera* in Growth and Haematology of *Cirrhinus mrigala* challenged

- with *Pseudomonas aeruginosa*. *Journal of Applied Pharmaceutical Science*, 2012; 2(7): 191-195.
63. Mukherjee D, Khatua TN, Venkatesh P, Saha BP and Mukherjee PK: Immunomodulatory potential of rhizome and seed extracts of *Nelumbo nucifera* Gaertn. *J Ethnopharmacol*, 2010; 24, 128(2): 490-4.
64. Sudha P, Asdaq SMB, Dhamingi SS and Chandrakala GK: Immunomodulatory activity of methanolic leaf extract of *Moringa oleifera* in animals. *Indian J Physiol Pharmacol* 2010; 54(2):133-140.
65. Gupta A, Gautam MK, Singh RK, Kumar MV, Rao ChV, Goel RK and Anupurba S: Immunomodulatory effect of *Moringa oleifera* Lam. extract on cyclophosphamide induced toxicity in mice. *Indian J Exp Biol*, 2010; 48(11): 1157-60.
66. Shinde UA, Phadke AS, Nair AM, Mungantiwar AA, Dikshit VJ and Saraf MN: Membrane stabilizing activity - a possible mechanism of action for the anti-inflammatory activity of *Cedrus deodara* wood oil. *Fitoterapia*, 1999; 70: 251-257.
67. Sumanth M, Mustafa SS: Antistress, adoptogenic and immunopotentiating activity roots of *Boerhaavia diffusa* in mice. *Int. J. Pharmacol*, 2007; 3: 416-420.
68. Bendjeddou D, Lalaoui K and Satta D: Immunostimulating activity of the hot water-soluble polysaccharide extracts of *Anacyclus pyrethrum*, *Alpinia galanga* and *Citrullus colocynthis*. *J Ethnopharmacol*, 2003; 88(2-3): 155-60.
69. Srikumar R, Jeya Parthasarathy N and Sheela De: Immunomodulatory activity of Triphala on neutrophil function. *Biol Pharm Bull*, 2005; 28: 398-403.