



## Natural Herbs & Plant-Based Repellent for Rodents And Geckos (Lizards)

Krushna P Mane, Amol V Pore, Gopika D Dongare, Dr. Sanjay K Bais

Department of Pharmacognosy, Fabtech College of Pharmacy Sangola, Maharashtra, India

### Abstract

Rodents and geckos are chronic home and agricultural pests, regularly liable for meals spoilage, structural damage, and the unfold of pathogenic microorganisms. Conventional chemical repellents offer brief manipulate however pose full-size drawbacks, which include environmental toxicity, dangerous residues, and dangers to human and animal health [1]. In seek of more secure alternatives, this challenge makes a speciality of the software of herbs and plant-derived bioactive compounds as herbal repellents. Botanicals together with the *Azadirachta indica* (neem), *Mentha piperita* (peppermint), *Allium sativum* (garlic), *Eucalyptus globulus* (eucalyptus), and *Capsicum annuum* (chili) this are decided on for his or her phytochemicals—terpenoids, alkaloids, flavonoids, and critical oils—which act as sensory irritants, smell deterrents, or feeding inhibitors [6]. Experimental formulations might be organized and examined to assess their efficiency, length of action, and protection as compared with chemical counterparts [25]. The challenge ambitions to increase cost-effective, biodegradable, and non-poisonous repellent answer that now no longer simplest lessen pest infestations however additionally decrease ecological harm [23]. By selling plant-primarily based totally alternatives, the look at contributes to sustainable pest control practices that beautify public health, meals protection, and environmental protection.

**Keywords:** Rodents, geckos, herbs, natural plants, repellents

### Introduction

Rodents are one of the most persistent and ubiquitous vertebrate pests that affect Human population. They are carriers of germs and diseases such as Plague, fever, neurosis and even some lethal diseases also. They cause significant damage to Agricultural products, dwellings and miscellaneous things [4]. More than 25 species of rodents are observed as pests that cause wide range of damage. This damage leads to ecological and environmental problems.

Hence to prevent this we are using various Methods to kill them which is harmful for environment. Up to an extent they cause Disturbance in civilization and cause social problems as well. We know it causes many problems, but we can't ignore its ecological importance as well [16]. Rodents are part of many food chains and hence plays a significant role in sustaining Ecological balance. Traditionally chemicals are used as repellents and rodenticides which Cause significant harm to our nature and killing rodents irrationally also comes up with a Whole another set of consequences [1, 11]. So, we must figure out a way which keeps their spread in Check without exactly harming our nature and killing them.

Rodents and geckos are widely recognized as nuisance pests that create health, economic, and environmental challenges. Rodents such as rats and mice damage stored grains, electrical wiring, and household structures, while also transmitting diseases like leptospirosis, plague, and salmonellosis. Geckos, though less destructive, are considered unhygienic due to their droppings and are commonly associated with food contamination in households [2]. Effective and safe control methods are therefore essential to reduce their impact.

Chemical repellents and pesticides remain the most commonly used for strategies. However, continuous application has been linked with pest resistance, toxic residues, and serious environmental concerns. In addition, exposure to synthetic chemicals may adversely affect human

health, pets, and beneficial non-target organisms. These limitations have encouraged the exploration of natural and plant-based alternatives for pest management [24].

Several plants are reported to possess bioactive compounds that deter or repel pests. Neem (*Azadirachta indica*) has been extensively studied for its insecticidal and antifeedant properties due to azadirachtin and limonoids. Peppermint (*Mentha piperita*) contains essential oils such as menthol and menthone, which have been shown to repel rodents effectively [15].

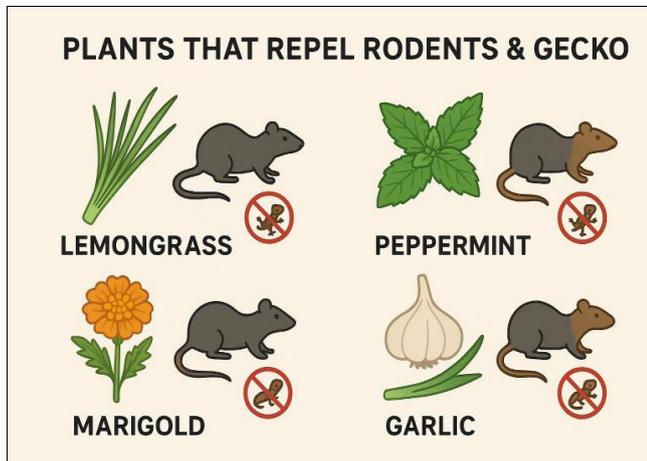
### Literature Review

**Plant Based Repellents:** Certain plant-based scent, such as peppermint or balsam fir, are offensive to these Rodent pests due to their great sense of smell. Some plant extracts also possess certain repellent Properties which may cause them a little harm but not the death. A product containing this Combination of these natural ingredients & essential oils is an effective and safe way to keep rats away. In following section, we will see the types of leaf extracts that can act as Repellents for rodent pests.

**Essential oils:** Essential oils that are extracted from some plants have significant Repellent properties against rodents especially rats and mice. The essential oil from Peppermint, lemon, citronella, eucalyptus, cinnamon, black pepper etc. are widely Used for the same purpose and are effective and harmless [22]. These Are extracted with the steam distillation method. In this method the herbs and plants Are boiled until the essential oils separate from the plant and float on the water. Later It is collected from surface and stored in amber or glass bottles.

**Secondary metabolites:** Secondary metabolites are substances manufactured by Plants and herbs that make them a competitive in their own environment. The Classes of plant secondary metabolites containing phenolics,

alkaloids, saponins, Terpenes, etc. Avast number of plant secondary metabolites (PSMs) produced by Higher plants has generated many alternatives to exploit their potential for pest Control. Many plants allelochemicals are attractive alternative to synthetic chemical Pesticides for pest management. A secondary plant metabolite methyl nonyl ketone (MNK) significantly repel the rodents with odour [13] Phenolic Acids, terpenoids, flavonoids from the plants can also be used for repelling purpose.



**Lemongrass:** Lemon grass, also known as *Cymbopogon citratus* or *C. flexuosus*, is a member of the Poaceae (grass family) family. Also known as West Indian lemongrass or lemon verbena grass, this plant has antimicrobial (antibacterial, antifungal), anti-inflammatory, anti-amoebic, analgesic, and antioxidant properties. Repellent for insects (flies, mosquitoes). The primary ingredient, citral (a blend of geraniol and neral), obscures smell trails and functions as a contact toxicant, making it extremely unpleasant to insects' and small pests' neurological and olfactory systems [9].

**Biological activities:** Is a medicinal and fragrant plant with a huge variety of organic activity because of its wealthy phytochemical profile, frequently including vital oils such as citral, geraniol, limonene, citronellal, and myrcene.

**Antimicrobial Activity:** Lemongrass oil shows strong antibacterial effects against both Gram-positive and Gram-negative bacteria, including *Escherichia coli*, *Staphylococcus aureus*, and *Salmonella* spp. Its antifungal action has been reported against *Candida albicans* and *Aspergillus* species, making it useful in controlling microbial growth on food and surfaces. Insecticidal &

**Repellent Activity:** Citral and geraniol are proven mosquito repellents, widely studied as natural alternatives to DEET. Lemongrass extracts repel cockroaches, ants, and flies [18].

**Mentha (Mint):** *Mentha piperita* (leaves/flowering tops) Lamiaceae is the family of mints. Brandy mint, peppermint, and carminative (gas-relieving), antioxidant, analgesic, and digestive aid are synonyms. Insect and rodent repellent (ant, spider, and mouse). Menthol, the main ingredient, irritates rodents' nasal passages and overwhelms their extremely sensitive olfactory systems [3].

**Biological Activities:** Peppermint (*Mentha piperita*) is a hybrid of water mint (*Mentha aquatica*) and spearmint (*Mentha spicata*) and is part of the Lamiaceae family. Most people recognize peppermint as the source of the aroma and essential oil whose compounds include menthol, menthone, menthyl acetate, limonene, and pulegone. This compound is responsible for peppermint's pungent odor and cooling sensation and various physiological effects [15].

**Antimicrobial Activity:** Antibacterial Activity of Peppermint Essential oil is against foodborne pathogens such as *Escherichia coli*, *Salmonella enterica* and *Staphylococcus aureus*. Also shows Antifungal Activity against *Candida albicans* and some molds, which aids in food preservation.

**Insecticidal & Repellent Activity:** Menthol and menthone are strong repellents for mosquitoes, ants, flies and cockroaches. Peppermint oil is used as a rodent repellent because it is strong scented and will overpower their sense of smell (Sharma *et al.*, 2017) [3]. Peppermint extracts are being used as green pesticides for stored grain outlined in research papers.



**Lavender:** Lavender, also known as *Lavandula angustifolia* or *L. officinalis*, is a member of the Lamiaceae (Mint Family) family. Insect repellent (moths, mosquitoes), sedative (calming), antimicrobial (antibacterial, antifungal), anti-inflammatory, antidepressant, and antioxidant are synonyms for English lavender. Many little pests really dislike the main ingredients, linalool and linalyl acetate, which disrupt the insect's nervous system.

**Biological Activities:** Lavender is a perennial aromatic herb well known for its pleasant fragrance and essential oil. The major chemical constituents of lavender essential oil include linalool, linalyl acetate, camphor, cineole, and terpenes, which are responsible for its wide range of pharmacological and pesticidal properties [8].

**Antimicrobial Activity:** Lavender essential oil is a demonstrates strong antibacterial effects against the *Staphylococcus aureus*, *Escherichia coli*, and *Pseudomonas*

aeruginosa. Shows antifungal activity against *Candida albicans* and dermatophytes, making it useful in skin care and preservation.

**Insecticidal & Repellent Activity:** Lavender oil is widely recognized as a natural mosquito, moth, and fly repellent. Studies have shown its effectiveness in repelling cockroaches and ants. The strong aroma is reported to deter rodents and reptiles, including lizards, making it a potential eco-friendly household repellent.

**Basil:** *Ocimum basilicum*, or basil (leaves and flower spikes) Lamiaceae is the family of mints. Great basil and sweet basil are synonyms for the following: antimicrobial, antioxidant, anti-inflammatory, and digestive assistance. Repellent for insects (mosquitoes, flies) [20]. Rich in substances like linalool, estragole, or eugenol (depending on the chemotype), the essential oil emits a potent, frequently poisonous, and ephemeral scent that repels insects.

**Biological Activities:** The essential oil of Basil contains linalool, eugenol, methyl chavicol (estragole), cineole, and camphor, which are responsible for its characteristic aroma and diverse biological functions.

**Antimicrobial Activity:** Basil oil and its extracts show the antibacterial effects against *Escherichia coli*, *Salmonella typhi*, *Staphylococcus aureus*, and *Pseudomonas aeruginosa* and also the antifungal properties have been reported against *Candida albicans* and *Aspergillus* species.

**Antioxidant Activity:** Rich in phenolic compounds (rosmarinic acid, caffeic acid, and flavonoids), basil has robust unfastened radical scavenging properties. Protects in opposition to oxidative pressure and cell damage. **Anti-inflammatory & Analgesic Activity :** Basil extracts lessen irritation and swelling through modulating prostaglandin synthesis. Traditionally used for alleviating headaches, sore throat, and fever.



**Marigold:** The marigold (*Tagetes erecta* or *T. patula*) belongs to the Asteraceae (Daisy Family) family of flowers and roots. African marigold, French marigold, nematocide (kills nematodes in soil), insect repellent (repels mosquitoes and whiteflies), antioxidant, antifungal, and anti-inflammatory, used for eye and skin health. Alpha-Terthienyl (alpha-T), which is found in root exudates, is

harmful to numerous nematodes and arthropods, frequently in a photoactivated way [19].

**Biological Activities:** Marigold extract and its essential oils are rich in terpenoids, flavonoids, carotenoids (lutein, zeaxanthin), and thiophenes, which give the plant strong biological and pesticidal properties [19]. **Antimicrobial Activity:** Extracts of marigold show antibacterial effects against *Staphylococcus aureus*, *E. coli*, and *Bacillus subtilis*. Antifungal activity has to be seen against *Fusarium*, *Aspergillus*, and *Candida* species. **Insecticidal & Repellent Activity :** Marigold is famous for repelling mosquitoes, flies, and nematodes due to its strong odor. It contains  $\alpha$ -terthienyl (a thiophene compound) which has nematocidal and insecticidal effects. Its pungent aroma shows repellent action against the rodents and geckos and keep away from inhabiting treated areas.

**Rosemary:** *Rosmarinus officinalis*, or rosemary (leaves and flowering tops) Lamiaceae is the family of mints. Alternative: Garden Rosemary. Strong antioxidant, antimicrobial, anti-inflammatory, memory-boosting, insect repellent (fleas, mosquitoes). Many pests are repelled by the potent, unpleasant, and camphoraceous vapor produced by active ingredients like camphor and 1,8-cineole [19].

**Biological Activities:** The herb rosemary is indigenous to the Mediterranean region. Its leaves are widely used in herbal medicine and as a spice. The plant contains Triterpenes, flavonoids, phenolic diterpenes, and essential oils. They are some bioactive substances in plants like 1,8-cineole, camphor, borneol, rosmarinic acid, carnosic acid, and carnosol etc. Biological and pest-repelling properties are attributed to these components. **Antimicrobial Activity :** Rosemary oil exhibits antibacterial effects against *Staphylococcus aureus*, *E. coli*, and *Listeria monocytogenes*. [17, 7].

**Formulation:** Herbal Sachet Formulation Formulation

**Table:** (Per 20 g)

Ingredients	Quantity
1. Dried Peppermint leaves	3g
2. Dried Basil leaves	3g
3. Dried Rosemary leaves	2g
4. Dried Sage leaves	3g
5. Dried Lavender buds	3g
6. Dried Marigold petals	2g
7. Dried Lemongrass pieces	2g
8. Optional booster: Essential Oil blend (Peppermint + Lemongrass + Eucalyptus)	4-6 Drop

**Material & Equipment** Dried part of plants (sun-dried or shade-dried, moisture <10%), Clean cotton/muslin cloth or tea bags (8 × 10 cm), Dropper, Airtight container for storage

**Procedure**

Collect the fresh plants parts and wash them. Dry under sun or shade dried. Crush the dried plants parts (not fine powder) Weighing according to formulation table. Transfer 20g in clean cotton or muslin cloth. Add 4-6 drops of essential oil in sachet. stored in airtight container until use.

## Result and Discussion

Findings support that aromatic herbs and their essential oils can be effective alternatives to synthetic repellents. Most of the identified plants act through strong odors and volatile compounds that pests find aversive. In addition to repelling pests, these herbs offer added benefits such as antimicrobial and medicinal properties. The chosen herbal sachet formulation—a blend of Peppermint, Basil, Rosemary, Sage, Lavender, Marigold, and Lemongrass—is based on the principle of chemical synergy. This blending strategy maximizes efficacy, as the combination of diverse volatile compounds (e.g., menthol, linalool, eugenol, and cineole) provides a broader spectrum of repellent action than any single herb could achieve alone.

## Conclusion

Natural plant-based repellents represent an eco-friendly and sustainable approach to managing rodent and gecko infestations. The reviewed herbs possess essential oils and bioactive compounds with proven antimicrobial and pest-repellent activities. The synergistic blend of these botanicals in a sachet formulation offers a safe, biodegradable, and sustainable alternative to chemical controls. With further standardization and testing, these herbs can serve as effective alternatives to harmful chemical repellents, contributing to safer pest management strategies.

## References

- Gupta P, Sharma A. Environmental toxicity and pest resistance in the backdrop of synthetic pesticides: A critical review. *Environmental Toxicology and Pharmacology*,2020;73:103289.
- Khan MA, Ullah R, Ali N. Reptiles and amphibians as reservoirs of zoonotic pathogens: A review of the global health risk. *Journal of Public Health Epidemiology*,2018;10(6):147–156.
- Sharma A, Singh P, Gupta P. Efficacy of peppermint oil as a rodent repellent in stored grain ecosystems. *Journal of Stored Products Research*,2017;74:115–123.
- Smith JA, Jones CA, Peterson EK. The economic and public health costs of invasive rodents worldwide. *Biological Invasions*,2019;21(10):3045–3058.
- Al-Ahmadi S, *et al.* Public health significance of geckos as carriers of pathogens. *Journal of Parasitic Diseases*,2020.
- Batish DR, Singh HP, Kohli RK, Kaur S. Eucalyptus essential oil as a natural pesticide. *Bioresource Technology*,2008;99(6):1709–1714.
- Borrás-Linares I, Pérez-Sánchez H, Lozano-Sánchez J, Segura-Carretero A. Rosemary extracts and their bioactive compounds. *Food Chemistry*,2014;145:661–667.
- Cavanagh HM, Wilkinson JM. Biological activities of lavender essential oil. *Phytotherapy Research*,2002;16(4):301–308.
- Ekpenyong C, *et al.* Phytochemical and therapeutic profiles of lemongrass. *Journal of Pharmacognosy and Phytochemistry*,2015;4(2):121–128.
- Isman MB. Botanical insecticides and repellents: From tradition to commercialization. *Annual Review of Entomology*,2006;51:45–66.
- Isman MB. Botanical insecticides in the twenty-first century—fulfilling their promise? *Annual Review of Entomology*,2020;65:233–249.
- Kennedy DO, *et al.* Effects of sage on memory and cognitive performance. *Pharmacology Biochemistry and Behavior*,2011;99(4):629–637.
- Koul O, Walia S, Dhaliwal GS. Essential oils as green pesticides: potential and constraints. *Biopesticides International*,2008;4(1):63–84.
- Kumar P, Mishra S, Malik A, Satya S. Repellent, larvicidal and pupicidal properties of essential oils and their formulations against the housefly *Musca domestica*. *Medical Veterinary Entomology*,2011;25(3):302–310.
- McKay DL, Blumberg JB. A review of peppermint tea and oil. *Phytotherapy Research*,2006;20(8):619–633.
- Meerburg BG, Singleton GR, Kijlstra A. Rodent-borne diseases and public health. *Critical Reviews in Microbiology*,2009;35(2):129–144.
- Nerio LS, Olivero-Verbel J, Stashenko E. Repellent activity of essential oils: A review. *Bioresource Technology*,2010;101(1):372–378.
- Oyedede AO, Gbolade AA, Sosan MB, Adewoyin FB, Soyelu OL, Orafiya LO. Formulation of an effective mosquito-repellent topical product from lemongrass oil. *Phytomedicine*,2002;9(3):259–262.
- Serrato-Díaz LM, *et al.* Bioactivity of marigold extracts. *Industrial Crops and Products*,2014;57:223–231.
- Sharma A, *et al.* Herbal pest repellents: An overview. *International Journal of Agricultural Sciences*,2019;15(2):145–150.
- Singh R, Gupta P. Plant-derived repellents: Recent advances. *Journal of Environmental Biology*,2021;42(3):512–520.
- Singh R, Koul O, Rup PJ, Jindal V, Kaur S. Essential oils as green pesticides: potential and constraints. *Biopesticides International*,2016;12(2):63–84.
- Maneenet J, Kongkaew C. The repellent potential of herbal oils alone and in combination in mouse behavioral models (*Mus musculus*). *CMU Journal of Natural Sciences Technology*,2022;21(3):2022049.
- Quasim MA, Karn AK, Paul S, Lalthavel Hmar EB, Sharma HK. Herbal rodent repellent: a dependable and dynamic approach in defiance of synthetic repellent. *Bulletin of the National Research Centre*,2023;47:82.
- Shah JA, Zafar N, Khan MI, Hassan SM. Gel carriers for plant extracts and synthetic pesticides in pest control, 2022. PMC ID PMC9407565.
- Singla N, Thind RK. Avoidance behaviour of *Rattus rattus* to odours of eucalyptus and citronella oils under maze experiments. *Annals of Arid Zone*,2023;62(3):325–389.
- Tan SC, Tiong SY, Tiong KF. A novel green technology – Kaffir lime extract as lizard repellent. *IOP Conference Series: Materials Science and Engineering*,2020;736:012019.
- Taylor JB, Kelleher CT, Briggler R, O'Connell MT. Detering rodent seed-predation using seed-coating formulations including essential oils activated carbon. *Restoration Ecology*,2020;28(4):928–939.