

RESEARCH MONOGRAPH . COMPOUND PROFILE

Mitragynine (Kratom)

The principal alkaloid of Mitragyna speciosa (kratom), a partial mu-opioid agonist with low respiratory depression liability and significant abuse and dependence potential.

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COMPOUND CLASS	Indole alkaloid / partial mu-opioid agonist

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ABSTRACT

Mitragynine (CAS 4098-40-2; molecular formula C₂₃H₃₀N₂O₄; molecular weight 398.49) is the principal indole alkaloid of *Mitragyna speciosa* (kratom), a tree native to Southeast Asia. The compound and its 7-hydroxymetabolite are partial mu-opioid receptor agonists with G-protein-biased signaling that produces analgesia with reduced respiratory depression compared with classical opioids at equivalent analgesic potency. Kratom and mitragynine have substantial dependence and addiction liability with chronic use; FDA has issued multiple warnings, and DEA has attempted scheduling (currently not federally scheduled but prohibited in some states). The compound is sold as kratom leaf, kratom extracts, and isolated mitragynine. Doses are highly variable; typical kratom leaf doses are 1 to 5 grams.

1. Compound Identification

Mitragynine (Kratom) is described as indole alkaloid / partial mu-opioid agonist. The principal alkaloid of *Mitragyna speciosa* (kratom), a partial mu-opioid agonist with low respiratory depression liability and significant abuse and dependence potential.

1.1 Class summary

Indole alkaloid / partial mu-opioid agonist

1.2 Subtitle

The principal alkaloid of *Mitragyna speciosa* (kratom), a partial mu-opioid agonist with low respiratory depression liability and significant abuse and dependence potential.

2. Abstract

Mitragynine (CAS 4098-40-2; molecular formula $C_{23}H_{30}N_2O_4$; molecular weight 398.49) is the principal indole alkaloid of *Mitragyna speciosa* (kratom), a tree native to Southeast Asia. The compound and its 7-hydroxymetabolite are partial mu-opioid receptor agonists with G-protein-biased signaling that produces analgesia with reduced respiratory depression compared with classical opioids at equivalent analgesic potency. Kratom and mitragynine have substantial dependence and addiction liability with chronic use; FDA has issued multiple warnings, and DEA has attempted scheduling (currently not federally scheduled but prohibited in some states). The compound is sold as kratom leaf, kratom extracts, and isolated mitragynine. Doses are highly variable; typical kratom leaf doses are 1 to 5 grams.

3. Mechanism of Action

Partial mu-opioid receptor agonist with G-protein-biased signaling. Active metabolite 7-hydroxymitragynine is more potent.

The mechanistic profile described above represents the consensus position from peer-reviewed literature where available; for compounds with sparse formal characterization, this section reflects vendor-grade reports and structurally-related class pharmacology and should be interpreted with appropriate caution.

4. Pharmacokinetics and Routes of Administration

Pharmacokinetic data are summarized within the abstract for compounds with formal Phase 1 records. Compounds without published human pharmacokinetic studies are noted as such; investigators should treat the absence of data as a research limitation.

5. Reported Research Dose Ranges

1 to 5 grams of kratom leaf; isolated mitragynine doses lower.

Doses are scaled from clinical use where the compound is approved as a medicine, from Phase 2/3 trials where development advanced, or from rodent dose-response data scaled by allometric assumptions where the compound has no human clinical record. Investigators should treat dose ranges from research-chemical-grade vendors as starting points for their own pharmacokinetic and tolerability characterization rather than validated dosing recommendations.

6. Sourcing and Quality Verification

Investigators should obtain analytical confirmation of identity (mass spectrometry; for peptides, additionally amino acid analysis or N-terminal sequencing) and purity (HPLC area-percent, ideally greater than 95 percent) on every lot. Vendor certificates of analysis vary in quality; third-party analytical confirmation through independent laboratories (e.g., Janoshik Analytical, Anabolic Lab) is the gold standard for research-grade peptides and small molecules.

For compounds with established pharmaceutical-grade marketing in any jurisdiction, sourcing from the marketed product (where legal and accessible) provides the highest quality assurance.

7. Reconstitution and Handling

Peptides should be reconstituted in bacteriostatic water or sterile water for injection in the volume appropriate to the desired concentration; lyophilized peptides should be allowed to come to room temperature before reconstitution to minimize precipitation. Reconstituted peptides should be stored refrigerated and used within the timeframe specified by the manufacturer (typically 14 to 30 days for bacteriostatic water reconstitutions, shorter for sterile water).

Small molecules: storage conditions vary by compound; consult the certificate of analysis for the specific product. Most are stable at room temperature in dry, dark conditions; oxidation-sensitive compounds (e.g., catecholamine precursors) require cool storage and protection from light.

8. Stack Interaction Considerations

Investigators combining this compound with other research substances should consider receptor-level interactions (additive effects at shared targets), enzyme-level interactions (CYP-mediated drug-drug interactions where applicable), and pharmacodynamic interactions (additive sedation, additive serotonergic activity, additive hemodynamic effects).

The stack interaction section in published monographs of well-characterized compounds is necessarily incomplete for any specific combination; investigators should treat novel combinations with elevated caution and titrate gradually.

9. References

1. Kruegel AC, et al. The medicinal chemistry and neuropharmacology of kratom. Neuropharmacology 2018.

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