Pooled testosterone effects of ashwagandha and Tongkat Ali

Ashwagandha shows a modest average increase in men's blood testosterone. Tongkat Ali has a positive point estimate, but its corrected pooled result is too uncertain to establish an increase.

Analysis	Trials / men	SMD (95% CI)	p
Ashwagandha, expanded*	12 / ~610	0.44 (0.19 to 0.70)	0.0027
Ashwagandha, reported endpoints	8 / ~370	0.53 (0.11 to 0.95)	0.020
Tongkat Ali, corrected	4 / ~210	0.73 (−0.50 to 2.0)	0.15

Sources: Recalculation from the primary trial reports listed below. SMD is Hedges' g for final blood total testosterone, with random effects and modified Hartung–Knapp intervals. Positive values favor the supplement.

*The expanded ashwagandha estimate includes four trials requiring reconstructed means, imputed final standard deviations, model-based approximations, or assumed male group sizes. Its interval is conditional on those assumptions. The reported-endpoint analysis provides the stronger statistical foundation.

The absolute difference is about 56 ng/dL for ashwagandha

Analysis	Difference at follow-up	95% CI
Ashwagandha, expanded	+56 ng/dL	+38 to +74
Ashwagandha, reported endpoints	+58 ng/dL	+37 to +78
Tongkat Ali, corrected	+61 ng/dL	−68 to +190

These are differences versus placebo at the final assessment, rather than within-group increases. An SMD around 0.44 is conventionally a small-to-moderate effect on the testosterone measurement. It does not measure improvement in strength, mood, or sexual function.

The ashwagandha conclusion remains positive when the unusually large standardized result from Chauhan is removed: g = 0.37 (95% CI 0.081 to 0.67). Tongkat Ali's uncertainty remains substantial under each principal sensitivity check.

Search and calculation date: October 27, 2026. Scope: placebo-controlled oral single-ingredient trials reporting blood total testosterone in adult men, including male subgroups. Other testosterone outcomes and unpoolable reports are accounted for on page 4.

Ashwagandha's expanded pool covers 12 trial cohorts

Trial	Men	ng/dL difference	Hedges' g
Ambiye 2013	46	+63	0.43
Wankhede 2015	50	+34	0.23
Lopresti 2019	37	-17	-0.081
Chauhan 2022	50	+54	1.5
Mishra 2024	41	+120	1.1
Puttaswamy 2025	37	+83	0.45
Vaidya 2025	36	+120	0.45
Khanna 2026	76	+81	0.28
Smith 2023*	56	+43	0.35
Verma 2023*	34	+27	0.19
Mutha 2025*	93	+120	0.42
Thanawala 2026*	53	+37	0.25

Sources: A1–A12. Values are final treatment minus placebo means. Mishra's two doses were combined before comparison with its single placebo group. All men are counted once. A negative final-level difference can coexist with a positive change from baseline when starting levels differ.

Four additional trials require reconstruction

Mutha: final means reconstructed from baseline plus reported change; final SDs set equal to baseline SDs. Verma: the same reconstruction, with additional caution because its narrative and testosterone table disagree about significance, and some aggregate values are internally inconsistent.

Smith: estimated marginal means and their standard errors were reported. The expanded analysis approximates individual SDs as SE × √n; this is an approximation for model-adjusted estimates. Thanawala: 53 men were reported, without the male allocation by arm. The expanded analysis assumes 26 versus 27 men.

Changing the imputed final SDs by ±25% gives pooled g = 0.43–0.47. Testing all compatible male allocations in Thanawala gives g = 0.44–0.45. Removing all four reconstructed trials gives g = 0.53.

The raw-unit pool is strongly weighted toward Chauhan because its reported SDs are much smaller than those in most other trials. Removing Chauhan changes the reported-endpoint raw estimate to +72 ng/dL (95% CI +26 to +120).

Tongkat Ali's published large effect does not survive the audit intact

The widely cited 2022 review reported SMD 1.4 (95% CI 0.57 to 2.1). Rebuilding the eligible independent comparisons gives g = 0.73 (95% CI −0.50 to 2.0), p = 0.15. Even the conventional normal interval crosses zero: −0.021 to 1.5, p = 0.057.

Trial / comparison	Men	ng/dL difference	Hedges' g
George 2013	38	-58	-0.33
Chan 2021	32	+160	1.3
Chinnappan 2021	~100	+36	0.72
Leitao 2021 no exercise	21	+140	3.8
Leitao 2021 exercise	16	+3.7	0.088

Sources: T1–T4. Chinnappan's two active doses are combined. The two independent exercise strata in Leitão are combined within that trial before the four-trial analysis; they do not count as two independent studies.

The original pool has material comparison and counting problems

Exercise comparison: the review assigns g = 3.0 to Leitão's exercise comparison. The primary table gives final levels of about 370 ng/dL in both exercise arms. The correctly matched exercise comparison is g = 0.088. The review's large figure is consistent with comparison against the non-exercising placebo arm instead.

Shared control: Chinnappan's 35-person placebo group appears twice in the published pool. Combining its active arms avoids counting those controls twice. George is explicitly a subset of Ismail's larger trial, so these reports represent one cohort. George's final placebo sample is 17, not its baseline 19.

Thesis overlap: "Quin 2021" is the thesis of Kai Quin Chan, the first author of Chan 2021. Independence of its two-week sample from the journal sample could not be established. Replacing the journal sample with the thesis sample gives g = 0.72. Assuming both are independent gives g = 0.83 (95% CI −0.096 to 1.8; p = 0.067).

Leitão also reports 38 completers, while its arm-specific flow diagram sums to 37. This analysis uses the diagram. Its values labeled SD behave like standard errors; treating them as SE in a sensitivity analysis yields g = 0.58 (95% CI −0.50 to 1.7). The uncertainty is not resolved by that choice.

The remaining evidence is accounted for separately

"All" here means the broadest reconstructable male blood-total-testosterone dataset located in this search. A complete numerical pool of every report is not possible because some papers omit the required subgroup data or uncertainty estimates.

Ashwagandha report	Treatment in this review
Lopresti 2019 crossover	Salivary testosterone; separate outcome. Reported a positive treatment effect.
Coope 2026 sports trial	Salivary hormones in men and women; separate outcome.
Singhal 2026 stress trial	Blood testosterone pooled across both sexes; male-only means and SDs unavailable.
Gopal 2021; female sexual-health trials	Female populations; outside this male analysis.
Ahmad 2010; Mahdi 2011; Gupta 2013	Uncontrolled treatment or nonrandomized fertility comparisons; outside placebo-controlled pool.
Verma 2024 performance report	Companion report to the Verma trial; not a second testosterone cohort.

Sources: A13–A16 and the primary study references. Thanawala's preprint and journal article are also counted only once. Mutha and Khanna have distinct trial registrations.

Tongkat Ali report	Treatment in this review
Ismail 2012	Full-cohort endpoint SDs unavailable; George's reported subset represents the cohort. Full-cohort adjusted analysis was null.
Chan thesis, eight weeks	Separate longer experiment, 21 men; null result. Final raw SDs not tabulated; excluded from numerical pool.
Lim thesis 2017	Review lacks usable SDs and has implausible hormone units; linked thesis download timed out.
Talbott 2013; Zakaria 2023	Salivary outcomes. Talbott mixed-sex result positive; Zakaria male rugby trial null.
Tambi 2012; Henkel 2014	Uncontrolled before–after studies.
Udani 2014	Tongkat Ali plus Polygonum minus; cannot isolate Tongkat Ali.

Sources: T5–T9 and the 2022 review. The excluded null reports are a reason the positive Tongkat Ali point estimate should remain tentative.

The calculation uses one testosterone outcome and one contribution per trial

The primary comparison is final blood total testosterone in men. Free testosterone, salivary testosterone, women's results, and within-arm changes are separate outcomes. Final-level means and SDs are used consistently for Hedges' g; change-score SDs are not mixed with endpoint SDs.

For each comparison, the difference between treatment and placebo final means is divided by the pooled within-group final SD, with Hedges' small-sample correction. Sampling variance uses the standard large-sample approximation. Raw differences are also pooled directly in ng/dL, rather than converted from the pooled SMD.

Random-effects variance is estimated by restricted maximum likelihood (REML). The main intervals use modified Hartung–Knapp inference with trial count minus one degrees of freedom; its variance multiplier is bounded below by one. This prevents Hartung–Knapp from giving narrower intervals than the conventional method. Conventional normal intervals are retained as a sensitivity check.

For multi-dose studies, active-arm means and SDs are combined, including variation between arm means. The common placebo appears once. Leitão's exercise-matched comparisons have distinct participants and are combined by inverse variance within the trial. This imposes a common within-trial effect for aggregation; the strong contrast between exercise strata remains a limitation.

Analysis	SMD	Conventional 95% CI	HK 95% CI	I^2
Ash, expanded	0.44	0.23 to 0.66	0.19 to 0.70	42%
Ash, reported	0.53	0.19 to 0.87	0.11 to 0.95	60%
Tongkat, corrected	0.73	−0.021 to 1.5	−0.50 to 2.0	79%

Sources: Recalculation; Cochrane Handbook chapter 10. I^2 describes inconsistency in standardized trial effects. The expanded ashwagandha interval does not propagate uncertainty about imputed SDs, model-derived SDs, or missing sex-specific allocation.

Published summaries were used to find studies, then checked against the reports

Searches used Withania somnifera/ashwagandha and Eurycoma longifolia/Tongkat Ali, with testosterone, randomized, placebo, and publication-year terms through October 27, 2026. Reference lists and trial tables from the 2021 herbs review, two 2026 ashwagandha meta-analyses, the 2026 safety review, and the 2022 Tongkat Ali review were checked, followed by targeted primary-report retrieval.

This is an exploratory evidence audit and recalculation, not a preregistered systematic review or a duplicate-screened review. The eight-trial ashwagandha analysis is the most defensible estimate here; the 12-trial analysis answers the broader pooling question with explicit reconstruction.

The 2026 ashwagandha review reporting SMD 0.33 included a female trial and a salivary trial. Another review reports +57 ng/dL for men. Neither review's overall count of trials across all outcomes is the number of male testosterone trials.

Primary sources: ashwagandha

A1. Ambiye 2013 — oligospermic men, Table 1

A2. Wankhede 2015 — resistance training, Table 5

A3. Lopresti 2019 — stress trial, Table 3 (means and SEs)

A4. Chauhan 2022 — sexual well-being, hormone table

A5. Mishra 2024 — stress, two doses, male subgroup

A6. Puttaswamy 2025 — endurance, Table II

A7. Vaidya 2025 — safety trial, Table 5

A8. Khanna 2026 — sexual health, Table 4

A9. Smith 2023 — stress and fatigue, Table 4

A10. Verma 2023 — resistance training, Table 3

A11. Mutha 2025 — sexual health, baseline and change tables

A12. Thanawala 2026 — strength and endurance, male subgroup

A13. Lopresti 2019 — salivary crossover trial

A14. Coope 2026 — salivary hormones in athletes

A15. Singhal 2026 — mixed-sex stress trial and supplement

A16. Hormonal activity review — earlier fertility trials and companion reports

Primary sources: Tongkat Ali and synthesis methods

T1. George 2013 — Ismail trial subset; final sample sizes and mean/SEM table

T2. Chan 2021 — young men, two-week journal report

T3. Chinnappan 2021 — low testosterone, two doses

T4. Leitão 2021 — supplementation with and without exercise

T5. Ismail 2012 — full trial cohort

T6. Chan 2021 thesis — two-week and eight-week experiments

T7. Talbott 2013 — mixed-sex salivary testosterone

T8. Zakaria 2023 — salivary hormones in rugby players

T9. Lim thesis link cited by the 2022 review (retrieval failed)

R1. Tongkat Ali 2022 meta-analysis — original extraction and pooled effects

R2. Ashwagandha 2026 cognitive/physical meta-analysis

R3. Ashwagandha 2026 hormonal meta-analysis

R4. Ashwagandha 2026 safety review — additional trial inventory

R5. Herbs and testosterone 2021 systematic review

R6. Cochrane Handbook, chapter 10 — pooling continuous outcomes

Data provenance: Chan's numerical means and SDs were extracted from the 2022 review; its journal manuscript corroborates the design and final treatment mean. Other core trial means were checked in primary tables. Original downloaded reports, the full-precision extraction, and reproducible calculations are retained alongside this document.