KUHLE IMPALA ARROWS: Evaluation of Budget-Friendly Shafts

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Executive Summary

The Kuhle Impala 350 arrows demonstrated excellent weight consistency (within 1 grain) and straightness (≤ 0.001″ TIR).
Spine variance around the shaft exceeded the preferred ≤ 0.005″ standard in most cases but remains acceptable at this price point.
Nock tuning is recommended to optimize performance by aligning the neutral (weakest) plane.

Introduction

This white paper presents an evaluation of the Kuhle Impala 350 arrow shafts. The purpose of the evaluation was to assess the static spine, weight consistency, and straightness of these budget-priced arrows to determine their suitability for archers seeking an affordable yet reliable shaft.

Objectives

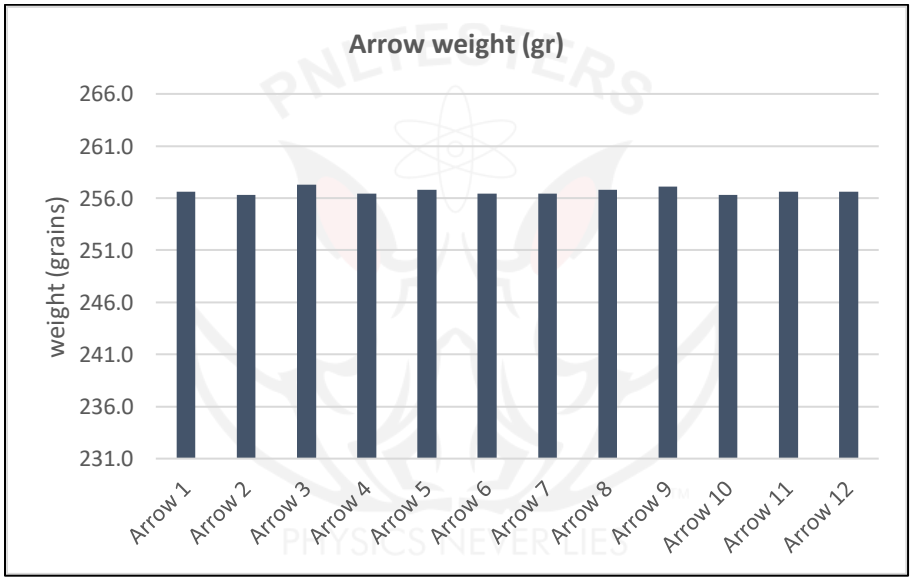
- Measure arrow weight consistency.
- Measure straightness using a dial indicator.
- Assess static spine and analyze variance around the shaft.
- Evaluate whether the shafts meet acceptable tolerances for practical use.

Methods

Weight Measurement

Twelve Kuhle Impala 350 arrows were weighed and their grains per inch (GPI) calculated. The manufacturer's claim was 7.7 GPI ±1 grain. Arrows evaluated between 8.01–8.04 GPI, with a total weight variance within 1 grain among a dozen arrows, meeting acceptable tolerances.

Arrow Shaft gr (32") +/-2gr		gpi (7.7)
Arrow 1	256.6	8.02
Arrow 2	256.3	8.01
Arrow 3	257.3	8.04
Arrow 4	256.4	8.01
Arrow 5	256.8	8.03
Arrow 6	256.4	8.01
Arrow 7	256.4	8.01
Arrow 8	256.8	8.03
Arrow 9	257.1	8.03
Arrow 10	256.3	8.01
Arrow 11	256.6	8.02
Arrow 12	256.6	8.02
Max	257.3	8.04
Min	256.3	8.01
DIFF.	1.0	0.03



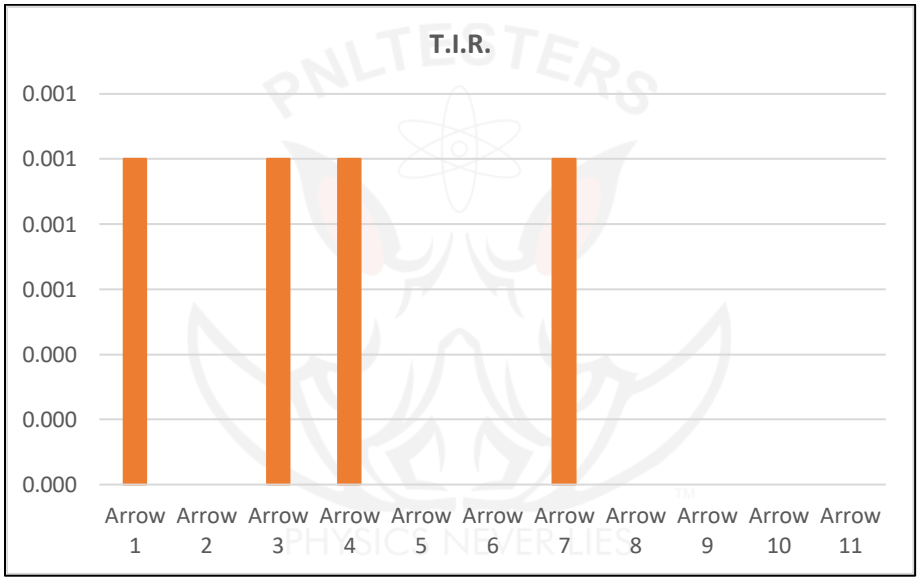
Weight Range:

- Max Weight: 257.3 gr
- Min Weight: 256.3 gr
- Difference: 1 gr

Straightness Test

Arrows were placed on two bearings set 28" apart. A dial indicator was positioned at the center of each shaft to measure Total Indicator Runout (TIR) as the shaft was rotated.

T.I.R. (28")	
Arrow 1	0.001
Arrow 2	0.000
Arrow 3	0.001
Arrow 4	0.001
Arrow 5	0.000
Arrow 6	0.000
Arrow 7	0.001
Arrow 8	0.000
Arrow 9	0.000
Arrow 10	0.000
Arrow 11	0.000
Arrow 12	0.000



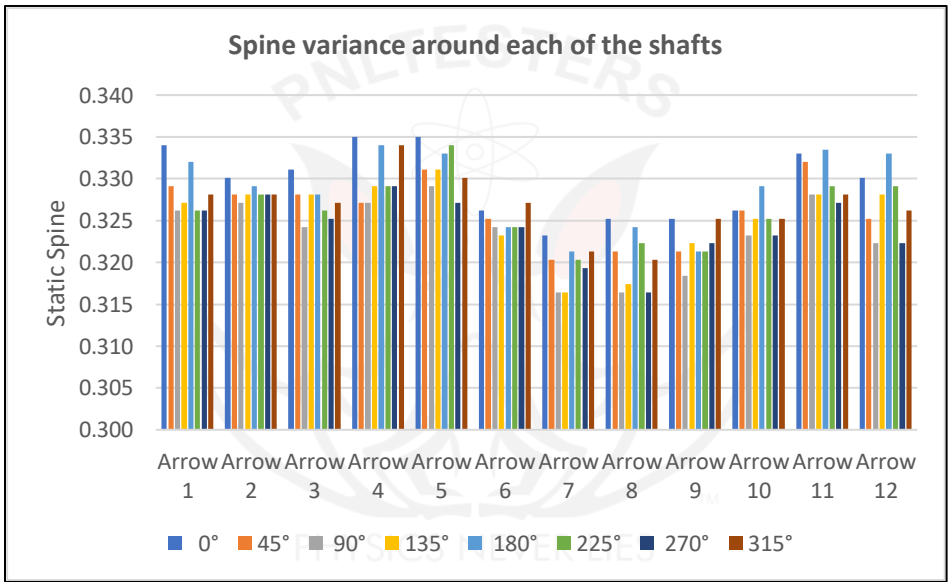
Static Spine Testing

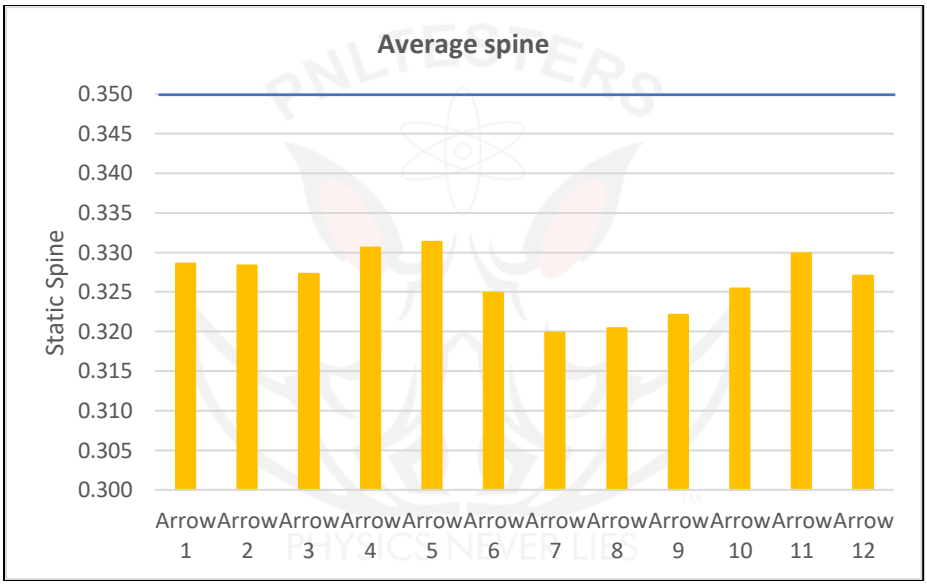
- Neutral plane identified using spine testers as a feel finder.
- Each shaft was marked at the neutral plane (0° point).
- Spine readings were taken every 45° around the shaft (0°, 45°, 90°, etc.).
- Average static spine and variance were calculated for each arrow.

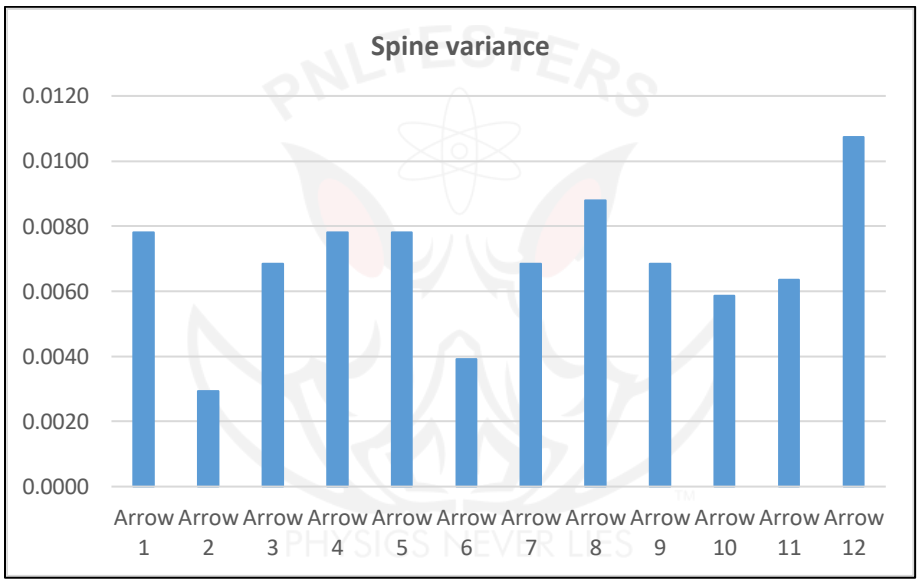
Static Spine Test Results

Spine Readings:

	KUHLE IMPALA 350								
	0°	45°	90°	135°	180°	225°	270°	315°	Average Spine
Arrow 1	0.334	0.329	0.326	0.327	0.332	0.326	0.326	0.328	0.329
Arrow 2	0.330	0.328	0.327	0.328	0.329	0.328	0.328	0.328	0.328
Arrow 3	0.331	0.328	0.324	0.328	0.328	0.326	0.325	0.327	0.327
Arrow 4	0.335	0.327	0.327	0.329	0.334	0.329	0.329	0.334	0.331
Arrow 5	0.335	0.331	0.329	0.331	0.333	0.334	0.327	0.330	0.331
Arrow 6	0.326	0.325	0.324	0.323	0.324	0.324	0.324	0.327	0.325
Arrow 7	0.323	0.320	0.316	0.316	0.321	0.320	0.319	0.321	0.320
Arrow 8	0.325	0.321	0.316	0.317	0.324	0.322	0.316	0.320	0.320
Arrow 9	0.325	0.321	0.318	0.322	0.321	0.321	0.322	0.325	0.322
Arrow 10	0.326	0.326	0.323	0.325	0.329	0.325	0.323	0.325	0.325
Arrow 11	0.333	0.332	0.328	0.328	0.334	0.329	0.327	0.328	0.330
Arrow 12	0.330	0.325	0.322	0.328	0.333	0.329	0.322	0.326	0.327





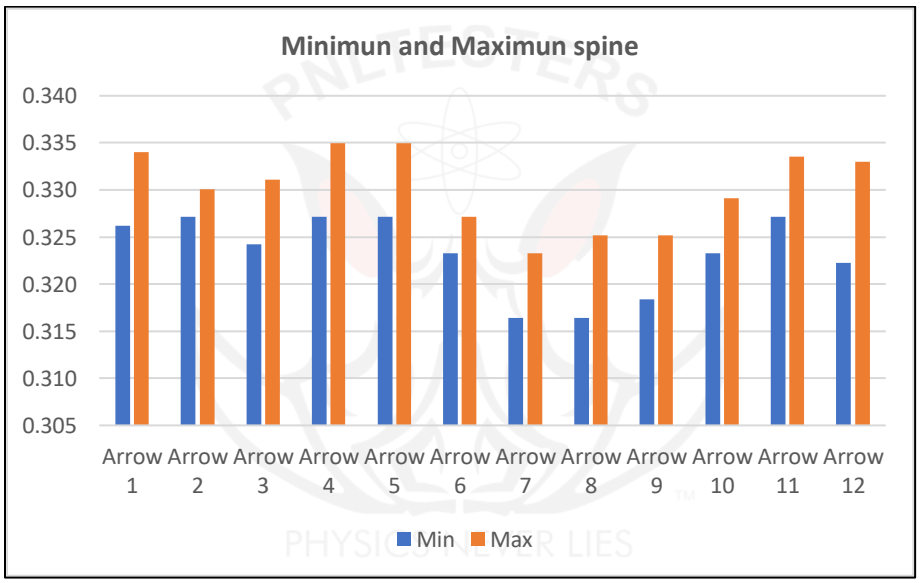


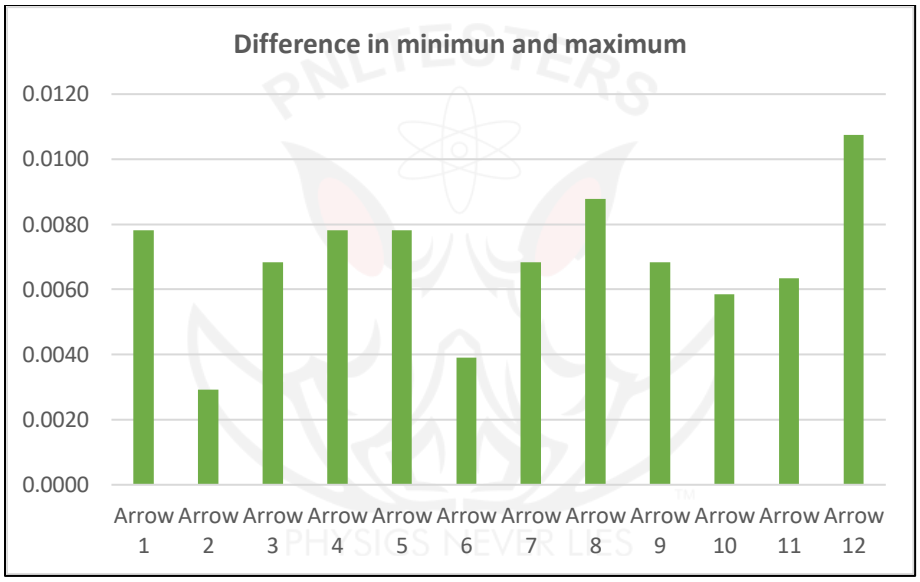
Variance Analysis

The variance analysis evaluates the consistency of spine stiffness around the circumference of each arrow. For each shaft, the highest (maximum) and lowest (minimum) spine readings measured at eight rotational positions were recorded. The difference between these two values represents the spine variance of the shaft.

Target standard: ≤ 0.005″ between maximum and minimum spine readings (for higher-grade arrows).
Tested arrows showed variances from 0.0029″ to 0.0107″, with most exceeding the preferred standard but acceptable for this price point. The circumferential variance suggests that nock tuning may help optimize flight by aligning the neutral plane.

	Min	Max	Diff.
Arrow 1	0.326	0.334	0.0078
Arrow 2	0.327	0.330	0.0029
Arrow 3	0.324	0.331	0.0068
Arrow 4	0.327	0.335	0.0078
Arrow 5	0.327	0.335	0.0078
Arrow 6	0.323	0.327	0.0039
Arrow 7	0.316	0.323	0.0068
Arrow 8	0.316	0.325	0.0088
Arrow 9	0.318	0.325	0.0068
Arrow 10	0.323	0.329	0.0059
Arrow 11	0.327	0.334	0.0063
Arrow 12	0.322	0.333	0.0107





Analysis

- The shafts met weight tolerance expectations, staying within 1 grain among the dozen evaluated.
- Straightness that meets acceptable limits even for higher-priced arrows, let alone a budget arrow.
- With the majority exceeding the preferred ≤ 0.005″ standard of higher-grade arrows; however, these results are acceptable for arrows in this price range.
- The arrows would benefit from nock tuning to minimize the impact of spine variance.

Conclusion

The **Kuhle Impala 350** arrows demonstrate:

Excellent weight consistency within advertised tolerances.
Straightness that meets acceptable limits for High priced arrows let alone a budget arrow.
Spine variance higher than optimal, but manageable through nock tuning.

While the Kuhle Impala shows spine variance around the shaft expected at this price point it remains a solid, budget-friendly choice suitable for archers willing to fine-tune their setup.

Recommendations

- Nock tuning is advised to align the weakest (neutral) plane of the shaft properly.
- Suitable for practice, hunting, and target use for archers seeking affordable performance.
- For competitive shooting or maximum consistency, a premium shaft with tighter spine tolerances may be preferred.

Notes on Terms

Neutral Plane

The neutral plane refers to the orientation around the shaft where it flexes the most (lowest stiffness) when subjected to load. Identifying this plane ensures the arrow bends consistently along its weakest axis…
*(*Notes on Terms → Neutral Plane*)*

Feel Finder

In this test, the "feel finder" refers to using the resistance or feedback of the spine-testing fixture to find the point of **greatest deflection (weakest point)** of the shaft the neutral plane. The shaft is rotated on the tester by hand, and the user detects where it flexes most easily, marking that orientation.

Appendix

Figures 1 through 12 are looking at the spine variances around each shaft.