

Superior Bioavailability of a Novel 1.5% Ashwagandha Formulation (Zenroot™): A Randomized, Double-Blind, Single-Dose, Comparative, Oral Bioavailability Study in Healthy Adults

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Supplement table 1

Demographic Data of all Subjects [N = 20] Participated in the Study					
Parameter	Mean	SD	Min	Max	CV%
Age (years)	33.55	4.98	26.00	43.00	14.84
Height (cm)	162.68	7.57	148.70	180.00	4.66
Weight (Kg)	66.13	8.01	51.40	78.20	12.12
BMI (Kg/m ²)	25.00	2.73	20.28	29.60	10.91

Supplement table 2. Additional details of the products used in the study

Parameters	ZEN 1.5	ASH5	ASH 10
Composition (Capsule)	125 mg providing 1.88 mg total withanolides	600 mg providing 30 mg total withanolides	500 mg providing 50 mg Withanolide glycosides, 160 mg of Oligosaccharides, ≤2.5 mg of Withanolide aglycone (as Withaferin A)
Source	Roots	ROOTS	Root
Standardization Level	HPLC	HPLC	HPLC
Extract Specifications	≥1.5 %w/w Total Withanolides	≥5 %w/w Total Withanolides	Withanolide glycosides: ≥ 10% (w/w) Oligosaccharides: ≥ 32% Withanolide aglycone (as Withaferin A): ≤ 0.5% (w/w)

Supplement table 3. Percentage composition of each phytoconstituents out of total withanolides and other key constituents in Zen 1.5

Sr.no.	Analyte Name	Content (%)
1	Withaferin A	0.575
2	Withanoside IV	0.302
3	WithanosideV/VI	0.354
4	12 deoxywithastramonolide	0.298
5	Withanolide A	0.417
6	Withanone	0.174
7	Withanolide B	0.115
	Total	2.234

Supplement table 4. Summary of safety data, including adverse events, vital signs, and any abnormal lab values.

Adverse Events Term	Zenroot 1.5%	Reference 1 5%	Reference 2 10%	Overall (N=20)
	n (%)	n (%)	n (%)	n (%)
Subjects with at least one AE	01(5%)	03(15%)	0	04(20%)
Decreased Haemoglobin level	0	02 (10%)	0	02(10%)
Increased Total WBC count	01(5%)	0	0	01(5%)
Decreased RBC count	0	01(5%)	0	01(5%)

Serum Chemistry

Parameters	Visits	N	Mean	SD
Plasma Glucose (R) (mg/dl)	Baseline	20	91.205	8.1757
	EOS	19	95.6211	7.89054
Serum Urea (mg/dl)	Baseline	20	18.9195	5.781
	EOS	19	15.2653	2.895
Serum Cholesterol (mg/dl)	Baseline	20	209.2700	31.146
	EOS	19	193.4263	27.3702
Serum Bilirubin (direct) (mg/dl)	Baseline	20	0.39700	0.803
	EOS	19	0.1732	0.061
Serum Total Protein (g/dL)	Baseline	20	8.0250	0.4166
	EOS	N/AP	N/AP	N/AP
Serum Albumin (g/dL)	Baseline	20	4.6100	0.231
	EOS	N/AP	N/AP	N/AP
Serum Globulin (g/dL)	Baseline	20	3.4150	0.411
	EOS	N/AP	N/AP	N/AP
Aspartate amino transferase (U/L)	Baseline	20	23.0400	6.413
	EOS	19	18.8895	5.4384
Serum Alanine aminotransferase (U/L)	Baseline	20	20.5550	8.712
	EOS	19	17.3789	7.175
Serum Alkaline phosphatase (U/L)	Baseline	20	74.2900	22.04
	EOS	N/AP	N/AP	N/AP
Serum creatinine (mg/dL)	Baseline	20	0.8170	0.154
	EOS	19	0.7726	0.1561
Serum Bilirubin (Total) (mg/dL)	Baseline	20	0.6855	0.3094
	EOS	19	0.5911	0.2989

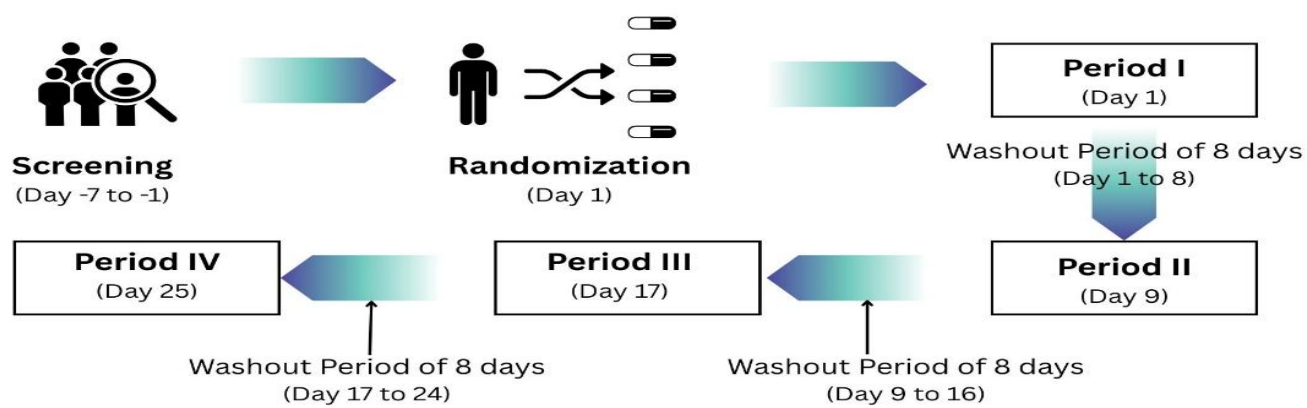
N: No of subjects; SD: Standard Deviation; EOS: End of studyU/L: Units/Litre; mg/dl: Milligrams / Decilitre,

Hematology Parameter

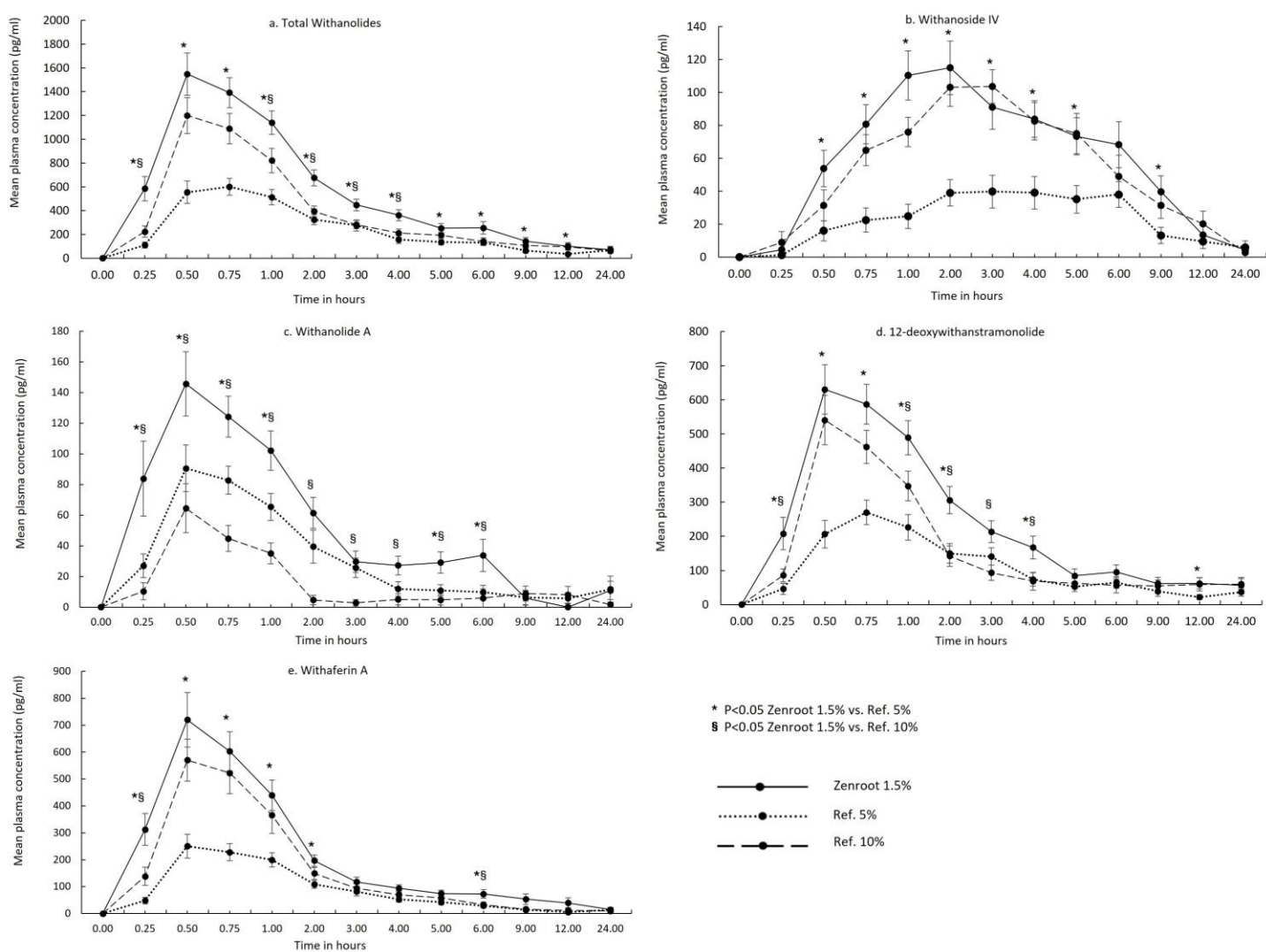
Parameters	Visits	N	Mean	SD
Total Leukocyte Count (cmm)	Baseline	20	7.9120	2.1389
	EOS	19	6.7774	1.3611
Red Blood Cell count (million/cmm)	Baseline	20	5.0010	0.4890
	EOS	19	4.8200	0.6282
Haemoglobin (g/dL)	Baseline	20	12.8550	1.1741
	EOS	19	12.2368	1.2208
Platelet Count (X 10 ³ /cmm)	Baseline	20	300.0000	76.9484
	EOS	19	301.3158	81.7027
Neutrophils %	Baseline	20	62.2900	8.3918
	EOS	N/AP	N/AP	N/AP
Lymphocytes %	Baseline	20	30.7350	7.3697
	EOS	N/AP	N/AP	N/AP
Monocytes %	Baseline	20	3.6800	0.8788
	EOS	N/AP	N/AP	N/AP
Eosinophils %	Baseline	20	3.2050	2.0459
	EOS	N/AP	N/AP	N/AP
Basophils %	Baseline	20	0.0750	0.1293
	EOS	N/AP	N/AP	N/AP
ESR (mm/hr)	Baseline	20	14.8000	7.4523
	EOS	N/AP	N/AP	N/AP

N: No of subjects; SD: Standard Deviation; EOS: End of Study, cmm: cubic millimetre; g/dl: Gram/decilitre fL: femtolitres,; Pg: picogram

Supplement figure 1. Visual timeline of the study phases



Supplement figure 2. Summary of bioavailability of Withanolides analytes



Certificate of Analysis

Product name	Zenroot Ashwagandha Pdr 1.5%			
Item code	NA			
Plant part	Root			
Genus/species	<i>Withania somnifera</i>			
Country of Origin	India			
Batch number	ASH/P1/02/057(C)			
Inspection lot no.	NA			
Date of Manufacturing	August, 2022			
Retest date	July, 2024			
Test	SPECIFICATION	REFERENCE METHOD	LOD/LOQ	RESULT
Description	Scarlet red color capsule filled with off white color powder	Visual	-	Complies
Total Withanolides	≥ 0.94 mg/cap	HPLC	-	0.95 mg/cap
Capsule filled weight	298.8 mg	-	-	-
Loss on drying	For information only	IR Moisture Analyzer	-	6.70%
Total plate count	Maximum 1,000 CFU/g	USFDA BAM		Complies
Yeast & Mould	Maximum 100 CFU/g	USFDA BAM	-	Complies
Salmonella	Absent /25 g	USFDA BAM	-	Complies
E. Coli	< 3 MPN/g	USFDA BAM	-	Complies
Staphylococcus sp.	< 10 CFU/g	USFDA BAM	-	Complies
Coliforms	< 10 CFU/g	USFDA BAM	-	Complies
Heavy metals				
Arsenic	Maximum 3.0 ppm	USP(ICP-MS)	0.1 ppm	Complies
Lead	Maximum 0.5 ppm	USP(ICP-MS)	0.1 ppm	Complies
Cadmium	Maximum 0.5 ppm	USP(ICP-MS)	0.1 ppm	Complies
Mercury	Maximum 1.0 ppm	USP(ICP-MS)	0.05 ppm	Complies

Remark: Product complies as per laid down specification.

Note: Since the product is derived from natural origin, there is possibility of slight variation in color due to variations in ecological, climatic conditions and source of raw materials

For OmniActive Health Technologies Limited.

Prepared by
Name: Sachin Dhavle
Date: 07/09/2022

Checked by
Name: Krishnaji Pawar
Date: 07/09/2022

Approved by
Name: Ravindra Nayakwadi
Date: 07/09/2022

(Computer generated valid without signature)

Manufactured By: OmniActive Health Technologies, Plot No. B-55, Supa, Parner MIDC, Ahmednagar -414301, India

Capsule filled at: OmniActive Health Technologies, Plot No. B-55, Supa, Parner MIDC, Ahmednagar -414301, India

Website: www.omniactives.com

Certificate of Analysis

Product name	Sensoril Ashwagandha 10%			
Item code	NA			
Plant part	Root & Leaves			
Genus/species	<i>Withania somnifera</i>			
Country of origin	India			
Batch number	ASH/P1/02/073(C)			
Inspection lot no.	NA			
Date of manufacturing	August, 2022			
Retest date	January, 2024			
Test	SPECIFICATION	REFERENCE METHOD	LOD/LOQ	RESULT
Description	Scarlet red color capsule filled with brown color powder	Visual	-	Complies
Withanolide glycosides *	≥ 25 mg/cap	HPLC-PDA	-	26.58 mg/cap
Withanolide aglycone (as Withaferin A)*	≤ 1.25 mg/cap	HPLC-PDA	-	0.53 mg/cap
Oligosaccharides*	≥ 80 mg/cap	HPLC-PDA	-	82.60 mg/cap
Capsule filled weight	299.8 mg	-	-	-
Loss on drying*	For information only	USP 921	-	2.35%
Total plate count	Maximum 1,000 CFU/g	USFDA BAM	-	Complies
Yeast & Mould	Maximum 100 CFU/g	USFDA BAM	-	Complies
Salmonella	Absent /25 g	USFDA BAM	-	Complies
E. Coli	< 3 MPN/g	USFDA BAM	-	Complies
Staphylococcus sp.	< 10 CFU/g	USFDA BAM	-	Complies
Coliforms	< 10 CFU/g	USFDA BAM	-	Complies
Heavy metals				
Arsenic	Maximum 3.0 ppm	USP(ICP-MS)	0.1 ppm	Complies
Lead	Maximum 0.5 ppm	USP(ICP-MS)	0.1 ppm	Complies
Cadmium	Maximum 0.5 ppm	USP(ICP-MS)	0.1 ppm	Complies
Mercury	Maximum 1.0 ppm	USP(ICP-MS)	0.05 ppm	Complies

Remark: Product complies as per laid down specification.

Note: Since the product is derived from natural origin, there is possibility of slight variation in color due to variations in ecological, climatic conditions and source of raw materials.

For OmniActive Health Technologies Limited.

*Analytes and values as per label claim of Sensoril (Batch number SNL-0064-21)

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Name: Sachin Dhavle
Date: 07/09/2022

Checked by
Name: Krishnaji Pawar
Date: 07/09/2022

Approved by
Name: Ravindra Nayakwadi
Date: 07/09/2022

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Manufactured By: Natreon, 2-D Janine Place, New Brunswick, NJ 08901

Capsule filled at: OmniActive Health Technologies, Plot No. B-55, Supa, Parner MIDC, Ahmednagar -414301, India

Website: www.omniactives.com

Certificate of Analysis

Product Name	KSM-66 Ashwagandha Root Extract 5%			
Item Code	NA			
Plant Part	Root			
Genus/Species	<i>Withania somnifera</i>			
Country of Origin	India			
Batch Number	ASH/P1/02/069(C)			
Inspection Lot No.	NA			
Date of Manufacturing	August, 2022			
Retest Date	March, 2024			
TEST	SPECIFICATION	REFERENCE METHOD	LOD/LOQ	RESULT
Description	Scarlet red color capsule filled with light yellowish brown color powder	Visual	-	Complies
Total Withanolides*	≥ 15.0 mg/cap	HPLC	-	16.13 mg/cap
Withaferin A*	< 0.3 mg / cap	HPLC	-	BDL
Capsule filled weight	300.3 mg	-	-	-
Loss on drying*	For information only	IR Moisture Analyser	-	2.96%
Total Plate Count	Maximum 1,000 CFU/g	USFDA BAM	-	Complies
Yeast & Mould	Maximum 100 CFU/g	USFDA BAM	-	Complies
Salmonella	Absent /25 g	USFDA BAM	-	Complies
E. coli	< 3 MPN/g	USFDA BAM	-	Complies
Staphylococcus sp.	< 10 CFU/g	USFDA BAM	-	Complies
Coliforms	< 10 CFU/g	USFDA BAM	-	Complies
Heavy Metals				
Arsenic	Maximum 3.0 ppm	USP(ICP-MS)	0.1 ppm	Complies
Lead	Maximum 0.5 ppm	USP(ICP-MS)	0.1 ppm	Complies
Cadmium	Maximum 0.5 ppm	USP(ICP-MS)	0.1 ppm	Complies
Mercury	Maximum 1.0 ppm	USP(ICP-MS)	0.05 ppm	Complies

Remark: Product complies as per laid down specification.

Note: Since the product is derived from natural origin, there is possibility of slight variation in color due to variations ecological, climatic conditions and source of raw materials.

*Values as per label claim of Ashwagandha KSM-66 (Batch number KSM/21/S127)

BDL- Below Detection Limit

For OmniActive Health Technologies Limited.

Prepared by
Name: Sachin Dhavle
Date: 07/09/2022

Checked by
Name: Krishnaji Pawar
Date: 07/09/2022

Approved by
Name: Ravindra Nayakwadi
Date: 07/09/2022

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Manufactured By: 5-9-225, 3rd Floor, Sanali Estate, C.A. Lane, Abids, Hyderabad 500001, Telangana State, India.

Capsule filled at: OmniActive Health Technologies, Plot No. B-55, Supa, Parner MIDC, Ahmednagar -414301, India.

Website: www.omniactives.com