8. STATISTICAL ANALYSIS

8. Statistical comparison of the results obtained by the developed methods by ANOVA and T – test

F and T values were computed and compared with the standard tabulated values at 5% level (P=0.05)

The experimental (calculated) F values did not exceed the tabulated values of F and T in the analysis of variance; indicating that there was no significant difference among the methods.

8.1. Ezetimibe

8.1.1. Spectroscopic methods

To compare the differences among the methods, an ANOVA test was applied to **five** different spectroscopic methods: Simple, 1st derivative, 2nd derivative, difference and IR spectroscopy.

Table 8.1.1: Result of one way ANOVA of Spectroscopic methods

Source	Degree of freedom	Sum of Squares	Mean Squares	F –test
Among Samples	4	8.88	4.43	
Within Replicates	20	20.64	1.72	**2.58**
Total	*24*	*29.52*		

***F theoretical = 3.01 at P = 0.05**

Conclusion: The calculated F values did not exceed the theoretical F values, at 0.05 level of significance, thus proposed methods give reproducible results.

8.1.2. Chromatographic methods

To compare the differences among the methods, an ANOVA test was applied to **FOUR** different chromatographic methods: HPLC, HPTLC-1(peak area and height) and HPTLC – 2.

Table 8.1.2: Result of one way ANOVA of Chromatographic methods

Source	Degree of freedom	Sum of Squares	Mean Squares	F –test
Among Samples	3	7.77	2.89	
Within Replicates	16	20.64	1.29	**2.01**
Total	*19*			

***F theoretical = 3.24 at P = 0.05**

Conclusion: The calculated F values did not exceed the theoretical F values, at 0.05 level of significance, thus proposed methods have no significant difference.

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8.2. Pravastatin

8.2.1. Spectroscopic methods

To compare the differences among the methods, an ANOVA test was applied to **SIX** different spectroscopic methods: Simple, 1st, 2nd, difference, three wavelength and IR spectroscopy.

Table 8.2.1: Result of one way ANOVA of Spectroscopic methods

Source	Degree of freedom	Sum of Squares	Mean Squares	F –test
Among Samples	5	4.95	2.47	
Within Replicates	24	14.65	1.22	**2.03**
Total	*29*	*19.60*		

***F theoretical = 2.62 at P = 0.05**

Conclusion: The calculated F values did not exceed the theoretical F values, at 0.05 level of significance, thus proposed methods give reproducible results.

8.2.2. Chromatographic methods

To compare the differences among the methods, an ANOVA test was applied to **FOUR** different chromatographic methods: HPLC, HPTLC-1(peak area and height) and HPTLC – 2.

Table 8.2.2: Result of one way ANOVA of Chromatographic methods

Source	Degree of freedom	Sum of Squares	Mean Squares	F –test
Among Samples	3	9.36	3.12	
Within Replicates	16	23.68	1.48	**2.11**
Total	*19*			

***F theoretical = 3.24 at P = 0.05**

Conclusion: The calculated F values did not exceed the theoretical F values, at 0.05 level of significance, thus proposed methods have no significant difference.

8.3. Rosuvastatin

8.3.1. Spectroscopic methods

To compare the differences among the methods, an ANOVA test was applied to **FOUR** different spectroscopic methods: Simple, 1st, difference and IR spectroscopy.

Table 8.3.1: Result of one way ANOVA of Spectroscopic methods

Source	Degree of freedom	Sum of Squares	Mean Squares	F –test
Among Samples	3	10.7	5.38	
Within Replicates	16	21.96	1.83	**2.94**
Total	*19*			

***F theoretical = 3.24 at P = 0.05**

Conclusion: The calculated F values did not exceed the theoretical F values, at 0.05 level of significance, thus proposed methods give reproducible results.

8.3.2. Chromatographic methods

To compare the differences among the methods, an ANOVA test was applied to **FOUR** different chromatographic methods: HPLC, HPTLC-1(peak area and height) and HPTLC – 2.

Table 8.3.2: Result of one way ANOVA of Chromatographic methods

Source	Degree of freedom	Sum of Squares	Mean Squares	F –test
Among Samples	3	13.95	4.65	
Within Replicates	16	20.88	1.93	**2.41**
Total	*19*			

***F theoretical = 3.24 at P = 0.05**

Conclusion: The calculated F values did not exceed the theoretical F values, at 0.05 level of significance, thus proposed methods have no significant difference.

8.4. Simvastatin

8.4.1. Spectroscopic methods

To compare the differences among the methods, an ANOVA test was applied to **FIVE** different spectroscopic methods: Simple, 1^{st}, 2^{nd}, difference and IR spectroscopy.

Table 8.4.1: Result of one way ANOVA of Spectroscopic methods

Source	Degree of freedom	Sum of Squares	Mean Squares	F –test
Among Samples	4	9.36	4.68	
Within Replicates	20	23.04	1.92	**2.44**
Total	*24*			

***F theoretical = 3.01 at P = 0.05**

Conclusion: The calculated F values did not exceed the theoretical F values, at 0.05 level of significance, thus proposed methods give reproducible results.

8.4.2. Chromatographic methods

To compare the differences among the methods, an ANOVA test was applied to **FOUR** different chromatographic methods: HPLC, HPTLC-1(peak area and height) and HPTLC – 2.

Table 8.4.2: Result of one way ANOVA of Chromatographic methods

Source	Degree of freedom	Sum of Squares	Mean Squares	F –test
Among Samples	3	8.52	2.84	**2.03**
Within Replicates	16	22.72	1.42	
Total	*19*			

***F theoretical = 3.24 at P = 0.05**

Conclusion: The calculated F values did not exceed the theoretical F values, at 0.05 level of significance, thus proposed methods have no significant difference.

8.5. Lovastatin

8.5.1. Spectroscopic methods

To compare the differences among the methods, an ANOVA test was applied to **FIVE** different spectroscopic methods: Simple, 1^{st}, 2^{nd}, difference and IR spectroscopy.

Table 8.5.1: Result of one way ANOVA of Spectroscopic methods

Source	Degree of freedom	Sum of Squares	Mean Squares	F –test
Among Samples	4	16.14	5.38	**2.94**
Within Replicates	20	29.24	1.83	
Total	*24*			

***F theoretical = 3.24 at P = 0.05**

Conclusion: The calculated F values did not exceed the theoretical F values, at 0.05 level of significance, thus proposed methods give reproducible results.

8.5.2. Chromatographic methods

To compare the differences among the methods, an ANOVA test was applied to **FOUR** different chromatographic methods: HPLC, HPTLC-1(peak area and height) and HPTLC – 2.

Table 8.5.2: Result of one way ANOVA of Chromatographic methods

Source	Degree of freedom	Sum of Squares	Mean Squares	F –test
Among Samples	3	9.11	4.55	**2.98**
Within Replicates	16	18.36	1.53	
Total	*19*			

***F theoretical = 3.01 at P = 0.05**

Conclusion: The calculated F values did not exceed the theoretical F values, at 0.05 level of significance, thus proposed methods have no significant difference.

8.6. Ezetimibe and Simvastatin

8.6.1. Spectroscopic methods

To compare the differences among the methods, an ANOVA test was applied to **FIVE** different spectroscopic methods: ratio derivative, FDZC, IR and Chemometric (ILS & CLS) spectroscopy.

Table 8.6.1: Result of one way ANOVA of Spectroscopic methods

Source	Degree of freedom		Sum of Squares		Mean Squares		F –test	
	EZE	SIMVA	EZE	SIMVA	EZE	SIMVA	EZE	SIMVA
Among Samples	4		**8.59**	**18.62**	**1.28**	**2.84**	**2.98**	**3.05**
Within Replicates	20		**5.12**	**11.36**	**0.42**	**0.93**		
Total	*24*							

***F theoretical = 3.24 at P = 0.05**

Conclusion: The calculated F values did not exceed the theoretical F values, at 0.05 level of significance, thus proposed methods give reproducible results.

8.6.2. Chromatographic methods

To compare the differences among the methods, T - test was applied to TWO different chromatographic methods: HPLC and HPTLC

Table 8.6.2: Result of one way ANOVA of Chromatographic methods

Methods/ parameters	EZE		SIMVA	
	HPLC	HPTLC	HPLC	HPTLC
Mean %	**100.41**	**99.64**	**102.19**	**100.83**
SD	**0.78**	**0.42**	**0.52**	**0.72**

N	5	5	5	5
T-test	1.21		1.02	
T- tab	1.860			

Conclusion: The calculated T values did not exceed the theoretical T values, at 0.05 level of significance, thus proposed methods have no significant difference.

8.7. Ezetimibe and Pravastatin

8.7.1. Spectroscopic methods

To compare the differences among the methods, an ANOVA test was applied to **FIVE** different spectroscopic methods: DDZC, FDZC, IR and Chemometric (ILS & CLS) spectroscopy.

Table 8.7.1: Result of one way ANOVA of Spectroscopic methods

Source	Degree of freedom		Sum of Squares		Mean Squares		F –test	
	EZE	PRAVA	EZE	PRAVA	EZE	PRAVA	EZE	PRAVA
Among Samples	4		6.68	7.69	3.34	3.84	2.61	2.15
Within Replicates	20		15.36	21.48	1.28	1.79		
Total	*24*							

***F theoretical = 3.01 at P = 0.05**

Conclusion: The calculated F values did not exceed the theoretical F values, at 0.05 level of significance, thus proposed methods give reproducible results.

8.7.2. Chromatographic methods

To compare the differences among the methods, an ANOVA test was applied to **THREE** different chromatographic methods: HPLC, HPTLC (peak area and height).

Table 8.7.2: Result of one way ANOVA of Chromatographic methods

Source	Degree of freedom		Sum of Squares		Mean Squares		F –test	
	EZE	PRAVA	EZE	PRAVA	EZE	PRAVA	EZE	PRAVA
Among Samples	2		9.89	9.03	4.94	4.51	2.81	2.34
Within Replicates	12		21.12	23.16	1.76	1.93		
Total	*24*							

***F theoretical = 3.89 at P = 0.05**

Conclusion: The calculated F values did not exceed the theoretical F values, at 0.05 level of significance, thus proposed methods have no significant difference.

8.8. Ezetimibe and Rosuvastatin

8.8.1. Spectroscopic methods

To compare the differences among the methods, an ANOVA test was applied to **FOUR** different spectroscopic methods: FDZC, IR and Chemometric (ILS & CLS) spectroscopy.

Table 8.8.1: Result of one way ANOVA of Spectroscopic methods

Source	Degree of freedom		Sum of Squares		Mean Squares		F –test	
	EZE	ROSU	EZE	ROSU	EZE	ROSU	EZE	ROSU
Among Samples	3		5.55	6.15	1.85	2.05	2.36	2.77
Within Replicates	16		12.54	11.84	0.78	0.74		
Total	*19*							

***F theoretical = 3.01 at P = 0.05**

Conclusion: The calculated F values did not exceed the theoretical F values, at 0.05 level of significance, thus proposed methods give reproducible results.

8.8.2. Chromatographic methods

To compare the differences among the methods, an ANOVA test was applied to **FOUR** different chromatographic methods: HPLC A, HPLC B, HPTLC (peak area and height).

Table 8.8.2: Result of one way ANOVA of Chromatographic methods

Source	Degree of freedom		Sum of Squares		Mean Squares		F –test	
	EZE	ROSU	EZE	ROSU	EZE	ROSU	EZE	ROSU
Among Samples	3		11.39	10.25	3.79	3.41	1.89	2.11
Within Replicates	16		32.10	25.92	2.01	1.62		
Total	*19*							

***F theoretical = 3.24 at P = 0.05**

Conclusion: The calculated F values did not exceed the theoretical F values, at 0.05 level of significance, thus proposed methods have no significant difference.

8.9. Ezetimibe and Lovastatin

8.9.1. Spectroscopic methods

To compare the differences among the methods, an ANOVA test was applied to **FIVE** different spectroscopic methods: ratio derivative, FDZC, IR and Chemometric (ILS & CLS) spectroscopy.

Table 8.9.1: Result of one way ANOVA of Spectroscopic methods

Source	Degree of freedom		Sum of Squares		Mean Squares		F –test	
	EZE	SIMVA	EZE	SIMVA	EZE	SIMVA	EZE	SIMVA
Among Samples	4		8.56	11.44	2.14	2.88	2.88	3.12
Within Replicates	20		14.86	18.33	0.74	0.91		
Total	*24*							

***F theoretical = 3.24 at P = 0.05**

Conclusion: The calculated F values did not exceed the theoretical F values, at 0.05 level of significance, thus proposed methods give reproducible results.

8.9.2. Chromatographic methods

To compare the differences among the methods, T - test was applied to TWO different chromatographic methods: HPLC and HPTLC

Table 8.9.2: Result of one way ANOVA of Chromatographic methods

Methods/ parameters	EZE		LOVA	
	HPLC	HPTLC	HPLC	HPTLC
Mean %	100.90	99.71	101.23	100.88
SD	0.12	0.38	0.24	0.28
N	5	5	5	5
T-test	0.93		1.11	
T- tab	1.860			

Conclusion: The calculated T values did not exceed the theoretical T values, at 0.05 level of significance, thus proposed methods have no significant difference.

So, there is no significant difference among the methods.