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In vitro pharmacology studies on *Alocasia Sanderiana W. Bull*

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Abstract
Objective: This research is to investigate the anti-inflammatory and antidiabetic activity of ethanolic leaf, stem and root tubers extracts of *Alocasia Sanderiana W. Bull.*
Methods: Anti-inflammatory activity of ethanolic extracts of leaf, stem and root tubers of *Alocasia Sanderiana W. Bull* was evaluated using proteinase inhibiting activity and protein denaturation inhibiting activity methods. Asprin 20-100 µg/mL was used as standards for both the methods. Antidiabetic activity was measured using *in vitro* α-amylase inhibiting activity and in *vitro* α-glucosidase inhibition assay methods. Acarbose 20-100 µg/mL was used as standard for both the methods.
Results: Leaf shows more anti-inflammatory and antidiabetic activity than the stem and root.
Conclusion: *Alocasia sanderiana W. Bull* plant shows anti-inflammatory and antidiabetic activity due to presence of various phytoconstituents and it could be a source of new compounds.

Keywords: Anti-inflammatory activity, Antidiabetic activity, Araceae, *Alocasia sanderiana*

1. Introduction
Alocasia sanderiana W. Bull is a plant in the Araceae family. *Alocasia Sanderiana W. Bull* is also known as the kris plant because of the resemblance of its leaf edges to the wavy blade of the kalis dagger (also known as kris plant). It is a tropical perennial with upright shiny, V-shaped and deeply lobed leaves. The plant can be up to 6 ft (2 m) tall and large in its native habitat. However, cultivated specimens are smaller. It possesses leaves that are evergreen, pelted, V-shaped, deeply lobed, and a glossy deep-green with large silvery white veins. They are about 12-16 in (30-40 cm) long and 6-8 in (15-20 cm) wide, with red-green undersides. The leaf stem is about 2 ft (60 cm) long. The rhizome of *A. Sanderiana* is vertically placed and is known as root stock. Female flowers are grouped at the lower part of the inflorescence, whereas the male flowers are at the top. According to literature report, alocasia is a kris plant native to tropical and subtropical Asia to Eastern Australia. Alocasia genus consists of about 79 species of which 28 are cultivated variety. *Alocasia sanderiana W. Bull* plant extract used in nanosilver particles to fight and prevent bacteria in vitro [1] and *Alocasia sanderiana W.Bull* endemic plant available in Tamilnadu [2, 3, 4] India [5]. The various species of alocasia plats are used in the treatment of dysentery and leucorrhoea and they have anti-inflammatory, wound healing [6], cytotoxic [7, 8, 9], antimicrobial [10-14], Antioxidant [15-19], antidiabetic [20, 21], anticancer [22] and antitumor properties [23, 24, 25]. This plant my previous study is reported in phytochemical, antimicrobial and antioxidant activity of different parts like leaf, stem, and root tubers of *alocasia sanderiana W. Bull* plant. The aim of the present study is to evaluate the anti-inflammatory and antidiabetic activity of different parts like leaf, stem, and root tubers ethanolic extracts of *alocasia sanderiana* plant.

2. Materials and methods
2.1. Materials
All chemicals and solvents are of analytical reagent grade and procured from HI MEDIA and SD FINE chemicals. The healthy and disease free plant parts leaf, stem and root of *alocasia sanderiana* were collected from southern region of Coimbatore, Tamilnadu, India, in the month of January 2012. The botanical identification was authenticated by a botanist. The fresh plant parts of each leaf, stem and root were washed with tap water and then rinsed with distilled water. Washed plant material was air dried in the laboratory at room temperature for 5-8 days or until they were easily broken by hand. Once completely dried, plant parts were grounded to a fine powder using an electronic blender. Plants were stored in a closed container at room temperature until required.

2.2. Preparation of ethanolic crude extract
The powdered plant parts leaf, stem and root of each material were mixed with sufficient quantity of ethanol solvent. It was kept in rotary shaker at 100rpm for 48 hrs. At the end of 48 hrs, each extract was filtered through Whatman No.1 filter paper and the filtrates were concentrated at room temperature in order to reduce the volume. The paste like extracts were stored in pre-weighed screw capped bottles and the yield of extracts were weighed. These screw capped bottles were kept in refrigerator at 4 °C for future use. Each extract was individually reconstituted using minimal amounts of the extracting solvent prior to use.

3. Anti-inflammatory activity
The anti-inflammatory activity of leaf, stem and root ethanolic extracts of *A. Sanderiana* was determined by *in vitro* methods. Proteinase inhibiting activity and Protein denaturation inhibiting activity methods were employed to assess the anti-inflammatory potential. All the assays were carried out in triplicate.

3.1. *In vitro* Proteinase inhibiting activity
The test was performed according to the modified method of Oyedepo *et al.* [26] and Sakat *et al.* [27]. The reaction mixture (2 ml) containing 0.06 mg trypsin, 1 ml 20 mM Tris HCl buffer (pH 7.4) and 1ml test sample of different concentrations (100 - 500µg/mL) was incubated at 37 °C for 5 min and then 1 mL of 0.8% (w/v) casein was added. The mixture was incubated for an additional 20 min. 2 ml of 70% perchloric acid was added to arrest the reaction. Cloudy suspension was centrifuged and the absorbance of the supernatant was read at 210 nm against buffer as blank. The experiment was performed in triplicate. The inhibiting activity is reported as IC_{50} values (the concentration of the sample extract to inhibit 50% of protein inhibition under assay condition). The percentage inhibition of proteinase inhibitory activity was calculated.
Percentage inhibition = (Abs control - Abs sample) × 100/ Abs control

3.2. *In vitro* protein denaturation inhibiting activity
The reaction [28] mixture (0.5 mL) consisted of 0.45mL bovine serum albumin (5% aqueous solution) and 0.05ml of the sample extract (100-500 µg/mL). pH was adjusted to 6.3 using a small amount of 1N HCl. The samples were incubated at 37 °C for 20 min and then heated at 57 °C for 3min. After cooling the samples, 2.5 ml phosphate buffer saline (pH 6.3) was added to each tube. Turbidity was measured spectrophotometrically at 660 nm. For control tests 0.05 mL of distilled water was used instead of extracts while product control tests lacked bovine serum albumin. The IC_{50} value was defined as the concentration of the sample extract to inhibit 50% of protein denaturation under assay condition. The percentage inhibition of protein denaturation was calculated as follows.

Percentage inhibition = 100 - ((O.D of test - O.D of product control)/O.D of Control) x 100

4. Antidiabetic activity
The anti-diabetic activity of leaf, stem and root ethanolic extracts of *A. Sanderiana* was determined by *in vitro* methods. Alpha-Amylase inhibiting activity and Alpha-Glucosidase inhibiting activity methods were employed to assess the anti-diabetic potential. All the assays were carried out in triplicate.

4.1. *In vitro* α-amylase inhibiting activity
The α-Amylase (0.5 mg/mL) was premixed with extract [29] at various concentrations (100-500 µg/mL) and starch as a substrate was added as a 0.5% starch solution to start the reaction. The reaction was carried out at 37 °C for 5 min and terminated by addition of 2 ml of DNS (3,5-dinitrosalicylic acid) reagent. The reaction mixture was heated for 15 min at 100 °C and diluted with 10 ml of distilled water in an ice bath. α- amylase activity was determined by measuring spectrum at 540 nm. The IC_{50} value was defined as the concentration of the sample extract to inhibit 50% of α-amylase activity under assay condition. The % α-amylase inhibitory activity is calculated by the following formula % Inhibition = (Control OD-Sample OD / Control OD) × 100

4.2. *In vitro* α-glucosidase inhibition assay
The α-glucosidase inhibitory effect of plant extracts was determined according to the standard method [30]. For alpha glucosidase inhibition, yeast α-glucosidase was dissolved in 100 mM phosphate buffer, pH 7.0, containing bovine serum albumin 2 g/liter and sodium azide 0.2 g/liter which was used as enzyme source. Paranitrophenyl- α-d-glucopyranoside was used as substrate. Extract was weighed and serial dilutions of 100, 200, 300, 400, 500µg/mL were made up with equal volumes of dimethylsulfoxide and distilled water. 10 micro liters of extract dilutions was incubated for 5 min with 50 µL enzyme source. After incubation, 50 µL of substrate was added and further incubated for 5 min at room temperature. The pre substrate and post substrate addition absorbance was measured at 405nm on a microplate reader. The increase in absorbance on substrate addition was obtained. Each test was performed three times and the mean absorption was used to calculate percentage α-glucosidase inhibition. Acarbose was used as positive control with various concentrations. The concentration of acarbose and plant extract required to inhibit 50% of α - amylase activity under the conditions was defined as the IC_{50} value Percentage α-glucosidase inhibition was calculated according to the following formula;

$$\text{Percentage of inhibition} = \frac{[(\text{Control } 405 - \text{Extract } 405)] \text{ X } 100}{\text{Control } 405}$$

5. Results and discussion
In consideration of the importance of Anti-inflammatory and Antidiabetic activity investigation on endemic plants of the *A. Sanderiana* carried out in the present work. The result of the study and the discussion pertaining to it is presented below.

Anti-inflammatory activity
The anti-inflammatory activity of leaf, stem and root tubers ethanolic extracts of *A. Sanderiana* was determined by *in vitro* methods. Proteinase inhibiting activity and Protein denaturation inhibiting activity methods were employed to assess the anti-inflammatory potential.

5.1. *In vitro* Proteinase inhibiting activity
5.1.1. *In vitro* Proteinase inhibiting activity of leaf extracts
Proteinases have been implicated in arthritic reactions. Neutrophils are known to be a rich source of proteinase which carries in their lysosomal granules many serine proteinases. It was previously reported that leukocytes proteinase play an important role in the development of tissue damage during inflammatory reactions and significant level of protection was provided by proteinase inhibitors. Ethanolic leaf extract

exhibited significant antiproteinase activity at different concentrations 100, 200, 300, 400, 500 µg/mL percentage of inhibition activity 23.26±0.21, 28.71±0.18, 38.42±0.51, 48.01±0.26, 65.34±1.51% as shown in Table 1 and figure 1. It showed maximum inhibition 65.34±1.51% at 500 µg/mL. IC_{50} value was found to be 401.02±1.22 µg/mL for leaf extract. Standard aspirin different concentration 20, 40, 60, 80, 100 µg/mL showed the inhibition 51.32±0.34, 66.52±0.67, 76.69±0.54, 87.75±0.53, 90.31±0.37%. Sample leaf extract percentage of inhibition values comparable with standard values of asprin percentage of inhibition Figure 2.

Table 1: *In vitro* Proteinase inhibiting activity of *A. Sanderiana* ethanolic extracts

S. No	Sample Extract concentration (µg/mL)	Percentage of inhibition activity (%)			Asprin standard concentraion (µg/mL)	Standard Asprin % inhibition
		Leaf extract	Stem extract	Root extract		
1	100	23.26±0.21	15.02±0.91	10.11±0.33	20	51.32±0.34
2	200	28.71±0.18	28.92±0.11	14.97±0.90	40	66.52±0.67
3	300	38.42±0.51	42.06±0.59	19.09±0.48	60	76.69±0.54
4	400	48.01±0.26	55.05±0.74	28.06±0.87	80	87.75±0.53
5	500	65.34±1.51	60.62±0.01	49.75±0.70	100	90.31±0.37
6	IC_{50} (µg/mL)	401.02±1.22	475.09±0.61	523.74±3.10	IC_{50} (µg/mL)	22.60±0.06

*Values are means of three independent analysis ± Standard Deviation (n=3)

5.1.2. *In vitro* Proteinase inhibiting activity of stem extracts

Ethanolic stem extract exhibited significant antiproteinase activity at different concentrations 100, 200, 300, 400, 500 µg/mL percentage of inhibition activity 15.02±0.91, 28.92±0.11, 42.06±0.59, 55.05±0.74, 60.62±0.01% as shown in Table 1 and figure 1. It showed maximum inhibition 60.62±0.01% at 500 µg/mL. IC_{50} value was found to be 475.09±0.61 µg/mL for stem extract. Standard aspirin different concentration 20, 40, 60, 80, 100 µg/mL showed the inhibition 51.32±0.34, 66.52±0.67, 76.69±0.54, 87.75±0.53, 90.31±0.37%. Sample stem extract percentage of inhibition values comparable with standard values of asprin percentage of inhibition figure 2.

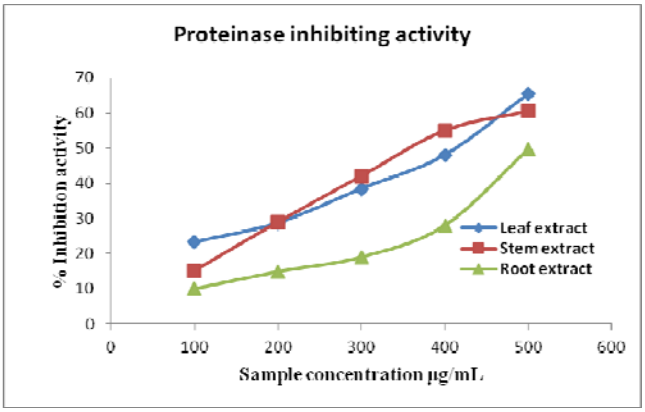

Fig 1: Comparison of *in vitro* Proteinase inhibiting activity

5.1.3. *In vitro* Proteinase inhibiting activity of root extracts

Ethanolic root extract exhibited significant antiproteinase activity at different concentrations 100, 200, 300, 400, 500µg/mL percentage of inhibition activity 10.11±0.33, 14.97±0.90, 19.09±0.48, 28.06±0.87, 49.75±0.70% as shown in Table 1 and figure 1. It showed maximum inhibition 49.75±0.70% at 500 µg/mL. IC_{50} value was found to be 523.74±3.10 µg/mL for root extract. Standard aspirin different concentration 20, 40, 60, 80, 100 µg/mL showed the inhibition 51.32±0.34, 66.52±0.67, 76.69±0.54, 87.75±0.53, 90.31±0.37%. Sample root extract percentage of inhibition values comparable with standard values of asprin percentage of inhibition figure 2.

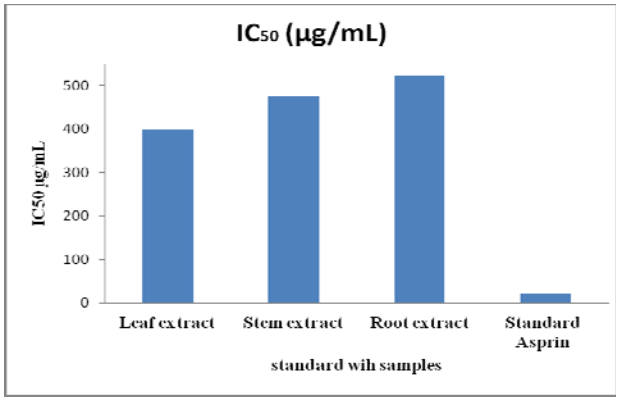

Fig 2: Comparison of *in vitro* Proteinase inhibiting activity IC_{50} values with plant extracts

The proteinase inhibiting activity of leaf, stem and root ethanolic extracts of *A. Sanderiana* was determined by *in vitro* methods. Sample leaf, stem and root extract percentage of inhibition values comparable with standard values of asprin percentage of inhibition. Ethanolic leaf extract inhibition values are higher compared with stem and root values. IC_{50} value of leaf extract 401.02±1.22 µg/mL, stem extract 475.09±0.61 µg/mL and root extract 523.74±3.10 µg/mL, less IC_{50} values indicates more potential efficiency of sample extract.

5.2. *In vitro* protein denaturation inhibiting activity

It was effective in inhibiting heat induced albumin denaturation at different concentrations as shown in Table 2. All plant extract inhibiting activity compared with standard asprin percentage of inhibition values.

5.2.1. *In vitro* protein denaturation inhibiting activity of leaf extracts

Ethanolic leaf extract inhibiting heat induced albumin denaturation at different concentrations as shown in Table 2 and figure 3. The plant leaf extract inhibiting activity compared with standard asprin percentage of inhibition values. Ethanolic leaf extract exhibited inhibiting activity at different concentrations 100, 200, 300, 400, 500µg/mL percentage of inhibition activity 36.31±0.93, 41.13±0.95, 58.97±3.33, 83.94±2.10, 86.24±1.50% as shown in Table 2 and figure 3. It

showed maximum inhibition 86.24±1.50% at 500 µg/mL. IC_{50} value was found to be 173.36±3.72 µg/mL for leaf extract. Standard aspirin different concentration 20, 40, 60, 80, 100 µg/mL showed the inhibition 51.32±0.34, 66.52±0.67, 76.69±0.54, 87.75±0.53, 90.31±0.37%. Sample leaf extract percentage of inhibition values comparable with standard values of asprin percentage of inhibition figure 4.

Table 2: *In vitro* protein denaturation inhibiting activity of *A. Sanderiana* ethanolic extracts

S. No	Sample Extract concentration (µg/mL)	Percentage of inhibition activity (%)			Asprin standard concentraion (µg/mL)	Standard Asprin % inhibition
		Leaf extract	Stem extract	Root extract		
1	100	36.31±0.93	25.21±0.73	18.76±0.91	20	51.32±0.34
2	200	41.13±0.95	32.07±0.25	23.84±0.87	40	66.52±0.67
3	300	58.97±3.33	45.31±0.09	36.06±0.08	60	76.69±0.54
4	400	83.94±2.10	59.74±0.26	54.61±0.49	80	87.75±0.53
5	500	86.24±1.50	63.07±0.71	59.66±0.87	100	90.31±0.37
6	IC_{50} (µg/mL)	173.36±3.72	310.07±0.92	447.10±2.03	IC_{50} (µg/mL)	22.60±0.06

*Values are means of three independent analysis ± Standard Deviation (n=3)

5.2.2. *In vitro* protein denaturation inhibiting activity of stem extracts

Ethanolic stem extract exhibited inhibiting activity at different concentrations 100, 200, 300, 400, 500µg/mL percentage of inhibition activity 25.21±0.73, 32.07±0.25, 45.31±0.09, 59.74±0.26, 63.07±0.71% as shown in Table 2 and figure 3. It showed maximum inhibition 63.07±0.71% at 500 µg/mL. IC_{50} value was found to be 310.07±0.92 µg/mL for stem extract. Standard aspirin different concentration 20, 40, 60, 80, 100 µg/mL showed the inhibition 51.32±0.34, 66.52±0.67, 76.69±0.54, 87.75±0.53, 90.31±0.37%. Sample stem extract percentage of inhibition values comparable with standard values of asprin percentage of inhibition figure 4.

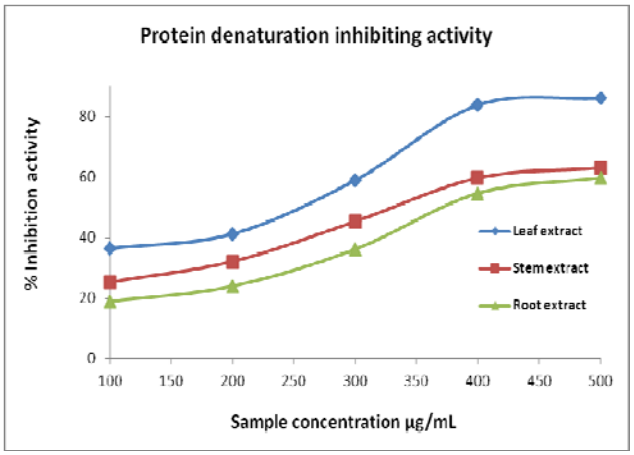

Fig 3: Comparison of *in vitro* Proteinase inhibiting activity

5.2.3. *In vitro* protein denaturation inhibiting activity of root extracts

Ethanolic root extract exhibited inhibiting activity at different concentrations 100, 200, 300, 400, 500µg/mL percentage of inhibition activity 18.76±0.91, 23.84±0.87, 36.06±0.08, 54.61±0.49, 59.66±0.87% as shown in Table 2 and figure 3. It showed maximum inhibition 59.66±0.87% at 500 µg/mL. IC_{50} value was found to be 447.10±2.03 µg/mL for root extract. Standard aspirin different concentration 20, 40, 60, 80, 100µg/mL showed the inhibition 51.32±0.34, 66.52±0.67, 76.69±0.54, 87.75±0.53, 90.31±0.37%. Sample root extract percentage of inhibition values comparable with standard values of asprin percentage of inhibition figure 4.

The protein denaturation inhibiting activity of leaf, stem and root ethanolic extracts of *A. Sanderiana* was determined by *in vitro* methods. Sample leaf, stem and root extract percentage of inhibition values comparable with standard values of asprin percentage of inhibition. Ethanolic leaf extract protein denaturation inhibition values are higher compared with stem and root values. IC_{50} value of leaf extract 173.36±3.72 µg/mL, stem extract 310.07±0.92 µg/mL and root extract 447.10±2.03 µg/mL, less IC_{50} values indicates more potential efficiency of sample extract.

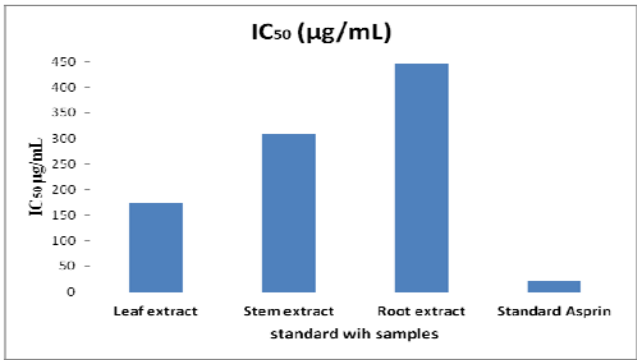

Fig 4: Comparison of *in vitro* Proteinase inhibiting activity IC_{50} values with standard

Antidiabetic activity

The anti-diabetic activity of leaf, stem and root tubers ethanolic extracts of *A. Sanderiana* was determined by *in vitro* methods. Alpha-Amylase inhibiting activity and Alpha-Glucosidase inhibiting activity methods were employed to assess the anti-diabetic potential. Percent alpha amylase inhibition IC_{50} values of standard Acarbose 47.77±0.09% values compared with leaf, stem and root tubers as shown in figure 6.

5.3. *In vitro* α-amylase inhibiting activity

The alpha amylase inhibitory activity of ethanolic leaf extracts of *A. Sanderiana* was investigated in this study and the results are shown in Table 3 and figure 5.

Table 3: *In vitro* α-amylase inhibiting activity of *A. Sanderiana* ethanolic extracts

S.No	Sample Extract concentration (µg/mL)	Percentage of inhibition activity (%)			Standard Acarbose concentration (µg/mL)	Standard Acarbose % inhibition
		Leaf extract	Stem extract	Root extract		
1	**100**	8.64±0.53	7.22±0.92	6.95±0.51	**20**	8.11±0.06
2	**200**	11.11±1.39	10.11±0.71	9.22±0.49	**40**	42.07±0.61
3	**300**	14.51±1.75	13.75±0.02	12.73±0.29	**60**	67.81±0.04
4	**400**	20.52±1.41	18.27±0.42	17.67±0.47	**80**	75.88±0.72
5	**500**	23.77±1.75	21.92±0.49	20.98±0.59	**100**	87.25±0.03
6	**IC_{50} (µg/mL)**	326.33±28.42	375.62±4.25	459.95±7.47	**IC_{50} (µg/mL)**	47.77±0.09

*Values are means of three independent analysis ± Standard Deviation (n=3)

5.3.1. *In vitro* α-amylase inhibiting activity of leaf extracts

Ethanolic leaf extract exhibited alpha amylase inhibitory activity at different concentrations 100, 200, 300, 400, 500µg/mL percentage of inhibition activity 8.64±0.53, 11.11±1.39, 14.51±1.75, 20.52±1.41, 23.77±1.75 as shown in Table 3. It showed maximum inhibition 23.77±1.75% at 500 µg/mL. IC_{50} value was found to be 326.33±28.42 µg/mL for leaf extract. Standard acarbose different concentration 20, 40, 60, 80, 100 µg/mL showed the inhibition 8.11±0.06, 42.07±0.61, 67.81±0.04, 75.88±0.72, 87.25±0.03%. Sample leaf extract percentage of inhibition values comparable with standard values of Acarbose percentage of inhibition.

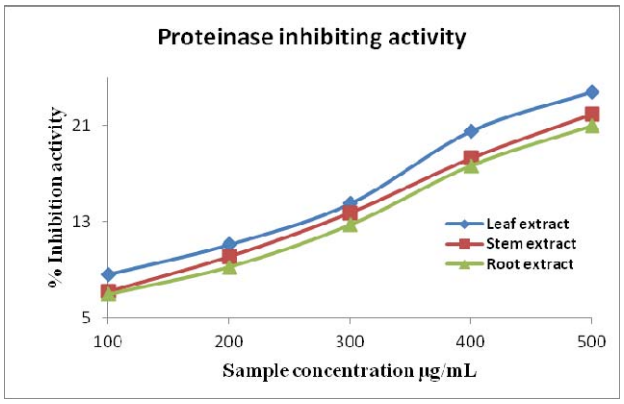

Fig 5: Comparison of *in vitro* α-amylase inhibiting activity

5.3.2. *In vitro* α-amylase inhibiting activity of stem extracts

The alpha amylase inhibitory activity of ethanolic stem extracts of *A. Sanderiana* was investigated in this study and the results are shown in Table 3 and figure 5. Ethanolic stem extract exhibited alpha amylase inhibitory activity at different concentrations 100, 200, 300, 400, 500µg/mL percentage of inhibition activity 7.22±0.92, 10.11±0.71, 13.75±0.02, 18.27±0.42, 21.92±0.49 as shown in Table 3. It showed maximum inhibition 21.92±0.49% at 500 µg/mL. IC_{50} value was found to be 375.62±4.25µg/mL for stem extract. Standard acarbose different concentration 20, 40, 60, 80, 100 µg/mL showed the inhibition 8.11±0.06, 42.07±0.61, 67.81±0.04, 75.88±0.72, 87.25±0.03%. Sample stem extract percentage of inhibition values comparable with standard values of Acarbose percentage of inhibition.

5.3.3. *In vitro* α-amylase inhibiting activity of root extracts

The alpha amylase inhibitory activity of ethanolic root extracts of *A. Sanderiana* was investigated in this study and the results are shown in Table 3 and figure 5. Ethanolic root extract exhibited alpha amylase inhibitory activity at different concentrations 100, 200, 300, 400, 500 µg/mL percentage of inhibition activity 6.95±0.51, 9.22±0.49, 12.73±0.29, 17.67±0.47, 20.98±0.59 as shown in Table 3. It showed maximum inhibition 20.98±0.59% at 500 µg/mL. IC_{50} value was found to be 459.95±7.47 µg/mL for stem extract. Standard acarbose different concentration 20, 40, 60, 80, 100 µg/mL showed the inhibition 8.11±0.06, 42.07±0.61, 67.81±0.04, 75.88±0.72, 87.25±0.03%. Sample root extract percentage of inhibition values comparable with standard values of Acarbose percentage of inhibition.

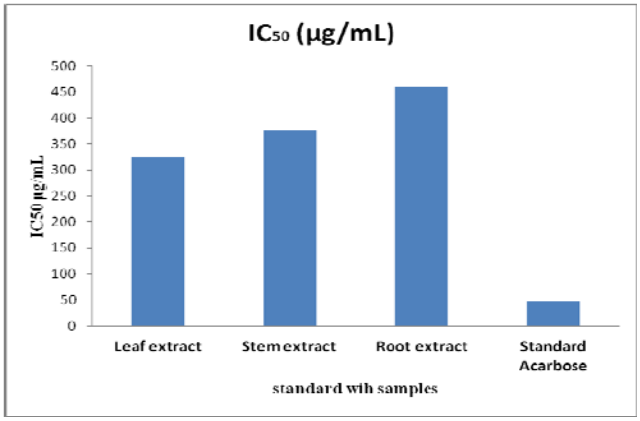

Fig 6: Comparison of *in vitro* α-amylase inhibiting activity IC_{50} values with standard

5.4. *In vitro* α-glucosidase inhibition assay

5.4.1. *In vitro* α-glucosidase inhibition assay of leaf extracts

The alpha glucosidase inhibitory activity of ethanolic leaf extracts of *A. Sanderiana* was investigated in this study and the results are shown in Table 4 and figure 7. Percent alpha glucosidase inhibition IC_{50} values of standard Acarbose 50.21±0.10% values compared with leaf, stem and root tubers as shown in figure 8.

Ethanolic leaf extract exhibited alpha glucosidase inhibitory activity at different concentrations 100, 200, 300, 400, 500µg/mL percentage of inhibition activity 12.17±0.34, 17.99±0.35, 21.44±0.77, 28.11±0.75, 34.44±1.05 as shown in Table 4. It showed maximum inhibition 34.44±1.05 % at 500 µg/mL. IC_{50} value was found to be 275.77±5.42% for leaf extract. Standard acarbose different concentration 20, 40, 60, 80, 100 µg/mL showed the inhibition 12.55±0.04, 44.43±0.76, 70.61±0.03, 78.87±0.76, 90.99±0.07%. Sample leaf extract percentage of inhibition values comparable with standard values of Acarbose percentage of inhibition.

Table 4: *In vitro* α-glucosidase inhibiting activity of *A. Sanderiana* ethanolic extracts

S. No	Sample Extract concentration (µg)	Percentage of inhibition activity (%)			Standard Acarbose concentraion (µg)	Standard Acarbose % inhibition
		Leaf extract	Stem extract	Root extract		
1	**100**	12.17±0.34	10.81±0.44	9.62±0.76	**20**	12.55±0.04
2	**200**	17.99±0.35	15.77±0.84	14.66±0.86	**40**	44.43±0.76
3	**300**	21.44±0.77	19.68±0.80	17.09±0.74	**60**	70.61±0.03
4	**400**	28.11±0.75	24.51±0.87	21.90±0.66	**80**	78.87±0.76
5	**500**	34.44±1.05	28.89±0.04	25.90±0.11	**100**	90.99±0.07
6	**IC_{50} (µg/mL)**	275.77±5.42	295.77±2.62	321.66±4.41	**IC_{50} (µg/mL)**	50.21±0.10

*Values are means of three independent analysis ± Standard Deviation (n=3)

5.4.2. *In vitro* α-glucosidase inhibition assay of stem extracts

The alpha glucosidase inhibitory activity of ethanolic stem extracts of *A. Sanderiana* was investigated in this study and the results are shown in Table 4 and figure 7. Ethanolic stem extract exhibited alpha glucosidase inhibitory activity at different concentrations 100, 200, 300, 400, 500µg/mL percentage of inhibition activity 10.81±0.44, 15.77±0.84, 19.68±0.80, 24.51±0.87, 28.89±0.04% as shown in Table 4. It showed maximum inhibition 28.89±0.04% at 500 µg/mL. IC_{50} value was found to be 295.77±2.62% for stem extract. Standard acarbose different concentration 20, 40, 60, 80, 100 µg/mL showed the inhibition 12.55±0.04, 44.43±0.76, 70.61±0.03, 78.87±0.76, 90.99±0.07%. Sample stem extract percentage of inhibition values comparable with standard values of Acarbose percentage of inhibition.

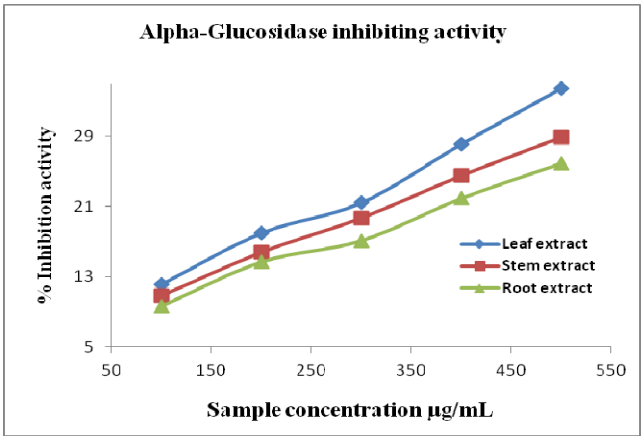

Fig 7: Comparison of *in vitro* α-glucosidase inhibiting activity

5.4.3. *In vitro* α-glucosidase inhibition assay of root extracts

The alpha glucosidase inhibitory activity of ethanolic root extracts of *A. Sanderiana* was investigated in this study and the results are shown in Table 4 and figure 7. Ethanolic root extract exhibited alpha glucosidase inhibitory activity at different concentrations 100, 200, 300, 400, 500µg/mL percentage of inhibition activity 9.62±0.76, 14.66±0.86, 17.09±0.74, 21.90±0.66, 25.90±0.11% as shown in Table 4. It showed maximum inhibition 25.90±0.1% at 500 µg/mL. IC_{50} value was found to be 321.66±4.41% for root extract. Standard Acarbose different concentration 20, 40, 60, 80, 100µg/mL showed the inhibition 12.55±0.04, 44.43±0.76, 70.61±0.03, 78.87±0.76, 90.99±0.07%. Sample root extract percentage of inhibition values comparable with standard values of Acarbose percentage of inhibition.

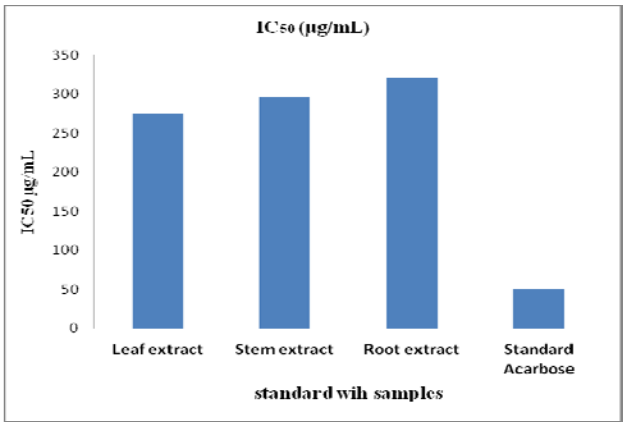

Fig 8: Comparison of *in vitro* α-glucosidase inhibiting activity IC_{50} values

6. Conclusion

From the present investigations, anti-inflammatory activity of *in vitro* proteinase inhibiting activity IC_{50} values comparing leaf, stem and root tubers 401.02±1.22, 475.09±0.61, 523.74±3.10% with IC_{50} values of standard asprin 22.60±0.06% is comparable. *In vitro* protein denaturation inhibiting activity IC_{50} values comparing leaf, stem and root tubers 173.36±3.72, 310.07±0.92, 447.10±2.03 with IC_{50} values of standard asprin 22.60±0.06% is comparable. Above two methods IC_{50} values indicate that ethanolic extracts of leaf shows more *in vitro* anti-inflammatory activity other then the stem and root tubers.

Antidiabetic activity of *in vitro* α-amylase inhibiting activity IC_{50} values comparing leaf, stem and root tubers 326.33±28.42, 375.62±4.25, 459.95±7.47% with IC_{50} values of standard Acarbose 47.77±0.09% is comparable. *In vitro* α-glucosidase inhibition assay IC_{50} values comparing leaf, stem and root tubers 275.77±5.42, 295.77±2.62, 321.66±4.41% with IC_{50} values of standard acarbose 50.21±0.10% is comparable. Above two methods of antidiabetic activity IC_{50} values indicate that ethanolic extracts of leaf shows more *in vitro* antidiabetic activity other than the stem and root tubers. *A. Sanderiana* ethanolic extracts of leaf shows more *in vitro* anti-inflammatory and Antidiabetic activity other than stem and root tubers. From the ethanolic extracts of *A. Sanderiana*, two new compounds have been isolated. The characterization and structural conformation of the new compounds are in progress.

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