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RESEARCH ARTICLE
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ANTIOXIDANT ACTIVITY AND EVALUATION OF SEVEN MEDICINAL PLANTS FOR POTENTIAL ROLE IN MANAGING OXIDATIVE STRESS IN ANEMIA

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Abstract:
Anemia is a medical disorder defined by insufficient oxygen-carrying ability to meet physiological needs and is related with increased or decreased RBCs. Oxidative pressure in erythrocytes is considered as crucial mechanism of hemolysis. Disruption of membrane integrity arises from fragility, dehydration as well as extended manufacturing of reactive oxygen species. Chronic hemolysis leads to lack of hemoglobin. These metabolic changes result in the depletion of essential nutrients and micronutrients which are required for correct cellular function. In the prospective of it, the present study aimed to evaluate the antioxidant activity of seven plants *Terminalia chebula, Terminalia bellirica, Syzygiumcumini, Phyllanthus emblica, Piper nigrum Linn, Amomum subulatum,* and *Cuminum. 2,2-diphenyl-1-picrylhydrazyl* method was used for evaluation of antioxidant activity. Antioxidant activity shown 88% to 76% at concentration of 250mg, 71%- 61% at concentration of 125mg and at 48% at concentration of 65.5mg results found in my research studies. IC_{50} value lower as the dose increase and P value < 0.05 shown the significance of activity.

Keywords: Antioxidant, Medicinal plants, Anemia, Red blood cells, Dehydration, Hemolysis

1. INTRODUCTION:

Anemia is a pathological condition characterized by a decrease in the number of red blood cells and these cells are responsible for transporting oxygen, so the symptoms of anemia are emaciation, pallor of the face, difficulty in breathing and loss of appetite (Michel & Martin-Ventura, 2020). The normal levels of hemoglobin were determined as follows: children 6–59 months (10–10.9 g/dL), children 5–11 years (11–11.4 g/dL), and children 12–14 years (11–11.9 g/dL), non-pregnant women and over 15 years (11-11.9 g/dL), pregnant women (10-10.9 g/dL), and men 15 years and above (11-12.9 g/dL) (Melku et al., 2018). There is indeed a connection between anemia and oxidative stress. Oxidative stress occurs when there is an imbalance between the production of free radicals (reactive oxygen species) and the body's ability to respond or detoxify their harmful effects. In the context of anemia Iron Deficiency Anemia is the most common type of anemia is iron deficiency anemia, which occurs when there is insufficient iron to produce hemoglobin (Adwas, Elsayed, Azab, & Quwaydir, 2019). Iron is a crucial component of hemoglobin, and its deficiency can lead to reduced oxygen-carrying capacity in the blood. This can trigger oxidative stress and damage to cells and tissues. In certain types

of anemia, such as hemolytic anemias, where red blood cells are destroyed prematurely, the breakdown of hemoglobin can release free iron, which may contribute to oxidative stress (Malay, Duraisamy, Brundha, & Kumar, 2018). Free iron can catalyze the formation of free radicals and reactive oxygen species, causing cellular damage. Chronic inflammation, often associated with certain chronic diseases, can contribute to both anemia and oxidative stress. Inflammatory processes can increase the production of reactive oxygen species and impact the availability of iron for red blood cell production (Di Meo & Venditti, 2020).

Purpose of current research was *in vitro* evaluation of the antioxidant activity of test sample; Terminalia chebula, Terminalia bellirica, Syzygiumcumini, Phyllanthus emblica, Piper nigrum Linn, Amomum subulatum, and Cuminum which are used for management of anemic disorders.

2. METHODOLOGY:

2.1 In Vitro Antioxidant Activity:

DPPH is used as a free radical agent to assess the anti-oxidant qualities of plant extract. 96 micro well plates were utilised for this. Take 1.4 milligrammes of DPPH and dissolve it in 20 ml of methanol to get a DPPH solution. Before using, check the DPPH's absorption at 517 nm.

Prepare a 1 mg/ml concentration of plant extract, then dilute it again more until it is 125 ug/ml. Using a micropipette, add 10 l of the sample solution and 90 l of the DPPH solution to the well of the plate. Take the 96-microplate's absorption at 517 nm after 30 minutes of incubation (Karuna, Dey, Das, Kundu, & Bhakta, 2018). The rate restraint will be taken as follows:

$$Scavenging\ activity\ \% = 100 - \frac{Af}{Ac} \times 100$$

3. RESULTS

3.1 Antioxidant Activity of Medicinal Plant:

Table 3.1: Result Antioxidant Activity of Medicinal Plant

Sr. #	Samples	Dose Conc. µg/ml	Percentage inhibition	IC_{50}
1	Halilah	250	76.6 ± 0.22	68.89
2		125	63.05± 0.32	
3		65.5	49.5± 0.11	
4	Balilah	250	78.6± 1.2	73.50
5		125	63.6± 0.33	
6		65.5	48.7± 0.24	
7	Jamun	250	80.9± 0.79	74.56
8		125	64.6± 2.33	
9		65.5	48.4± 1.56	
10	Amla	250	78.7± 1.46	72.88
11		125	63.7± 2.4	
12		65.5	48.8± 1.4	
13	Filfilsiyah	250	80.3± 0.78	67.28
14		125	65.0± 0.67	
15		65.5	49.7± 1.3	
16	Elaichikalan	250	82.8± 0.33	71.50
17		125	65.8± 0.98	
18		65.5	48.9± 0.67	
19	Zeerah	250	75.9± 0.43	79.94
20		125	61.8± 0.11	
21		65.5	47.8± 0.34	
22	+ve Control	250	88.0± 0.15	84.35
23		125	70.9± 1.23	
24		65.5	53.8± 0.1	
25		32.75	36.8± 0.23	
26	-ve Control	90µl		

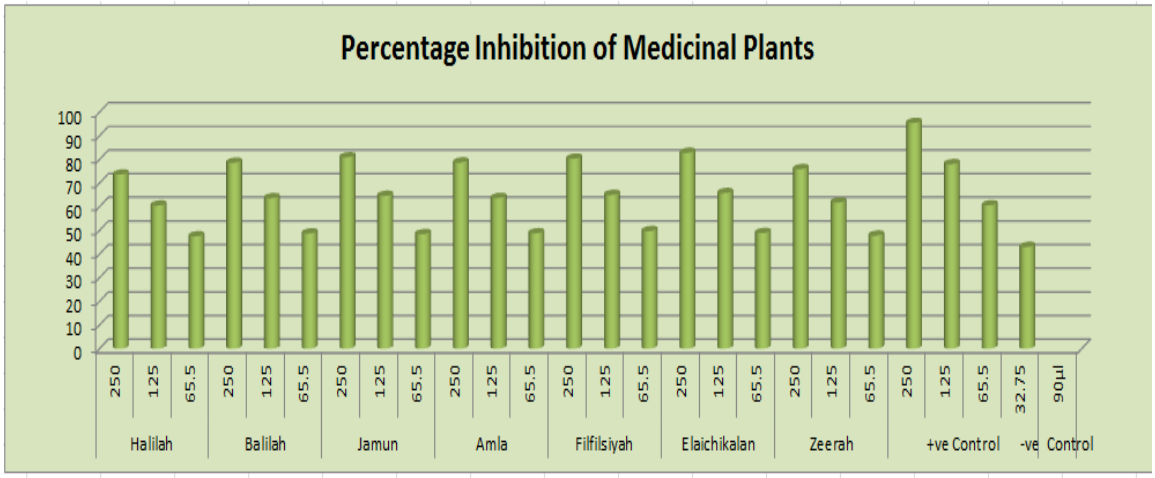

Fig 3.1: Percentage inhibition of Medicinal plant

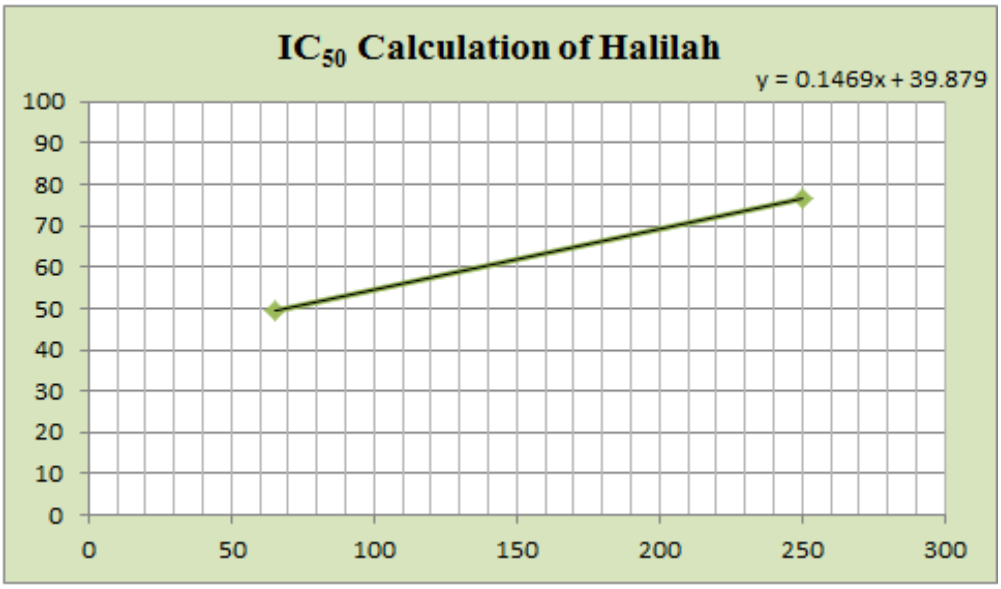

Fig 3.2- IC_{50} calculation of Hilalh

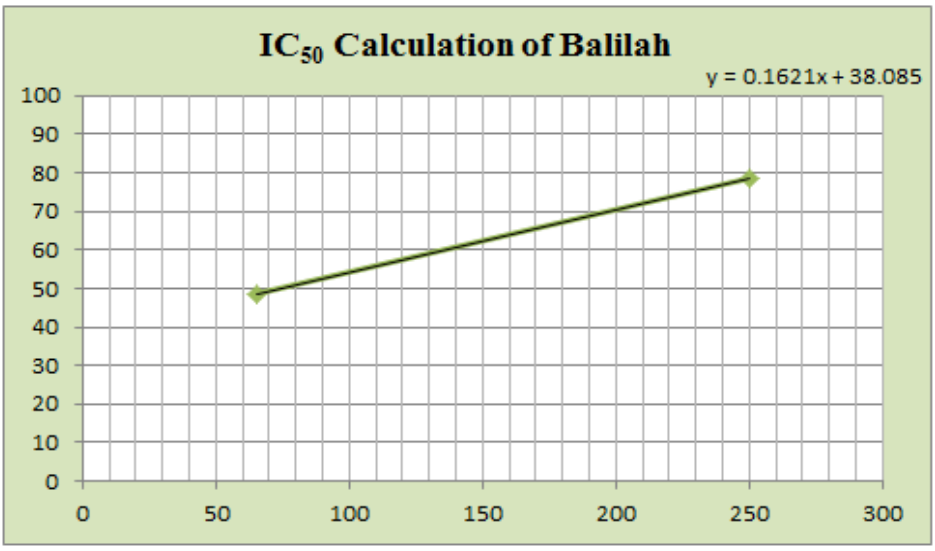

Fig 3.3- IC_{50} calculation of Balilah

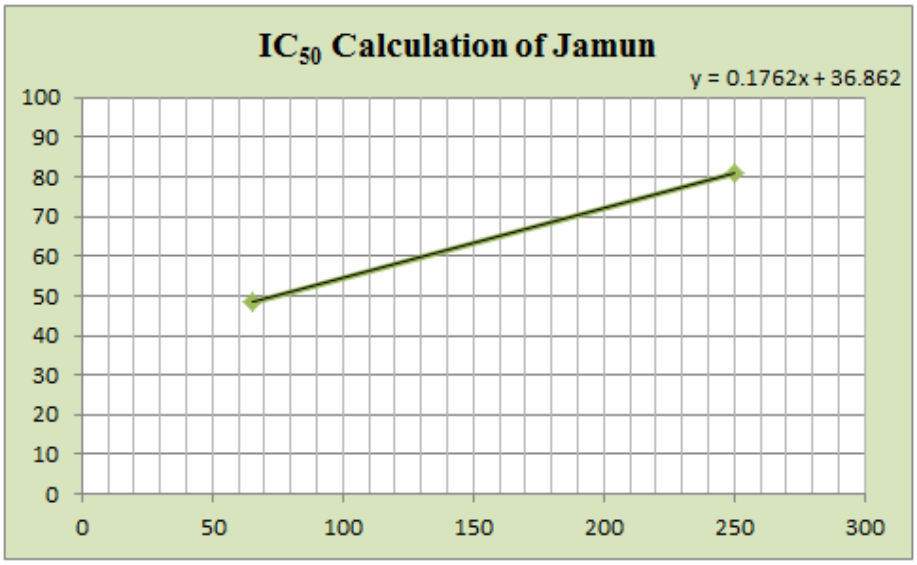

Fig 3.4- IC_{50} calculation of Jamun

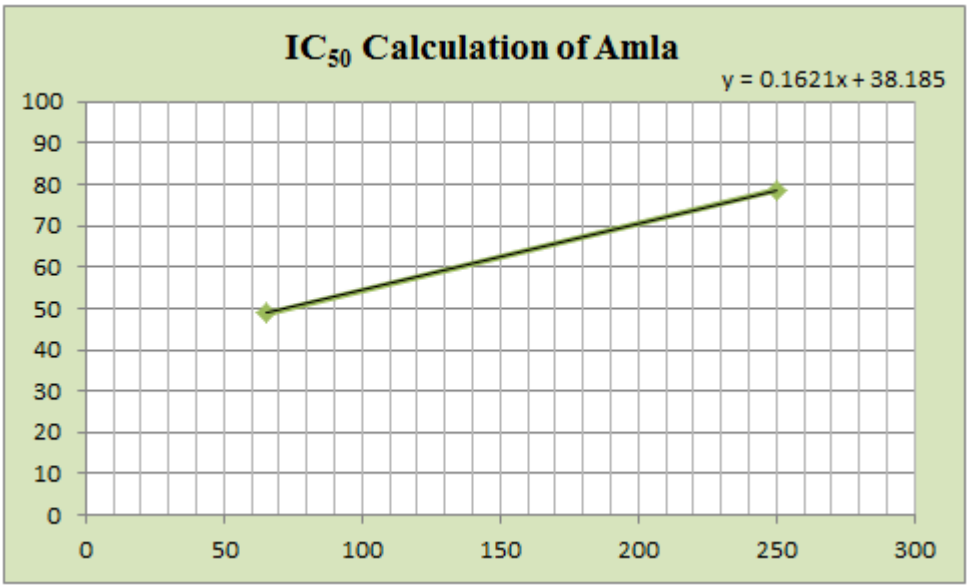

Fig 3.5- IC_{50} calculation of Amla

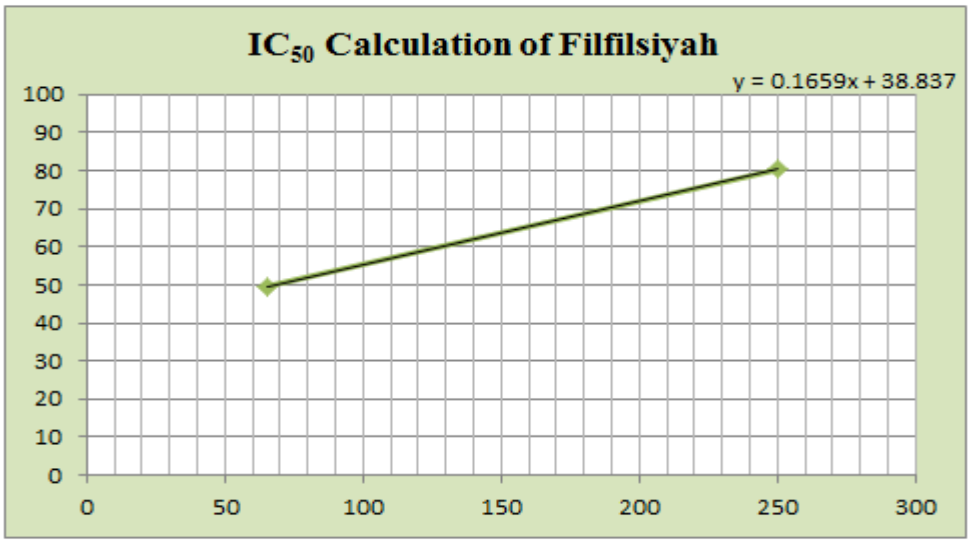

Fig 3.6- IC_{50} calculation of Filfilasiyah

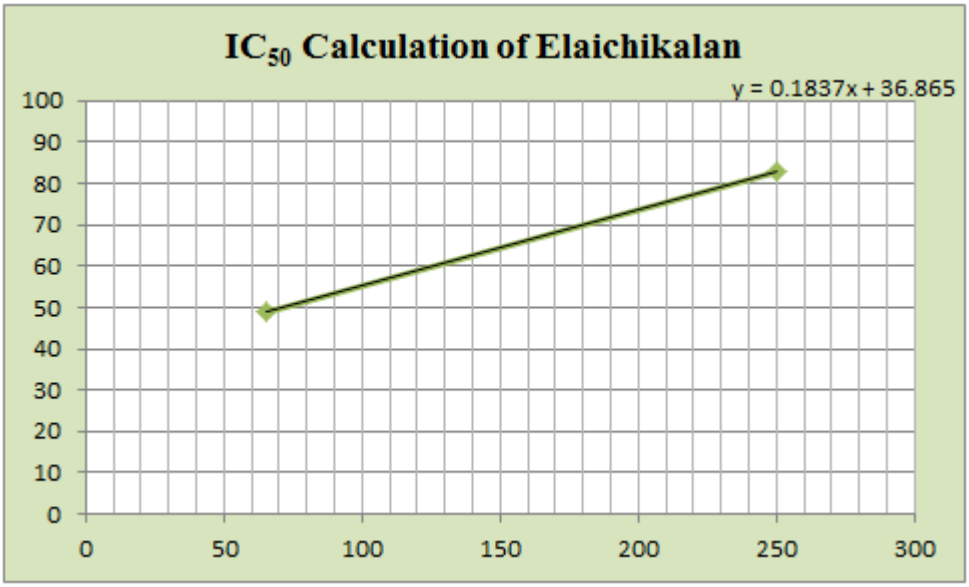

Fig 3.7 - IC_{50} calculation of Elaichikalan

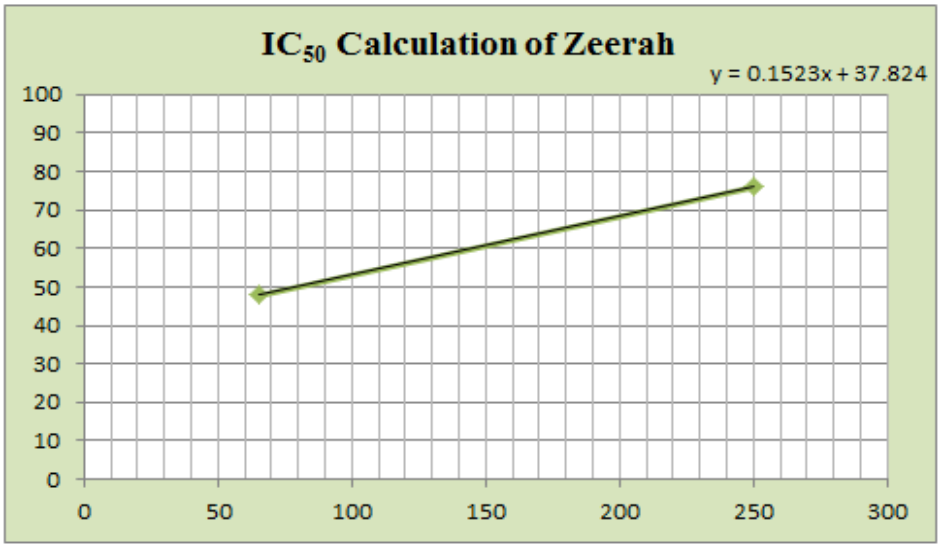

Fig 3.8- IC_{50} calculation of Zeerah

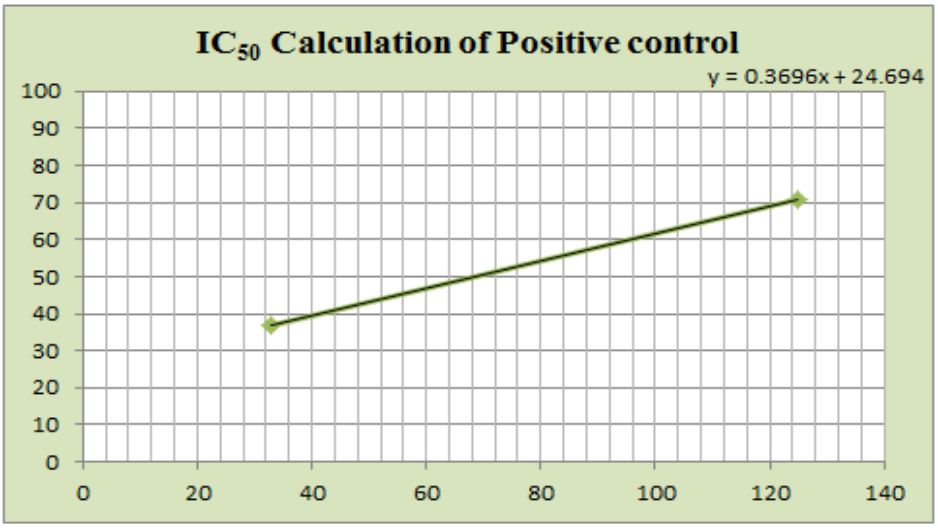

Fig 3.9- IC_{50} calculation of Positive control

DISCUSSION:

Medicinal plants have been used as medicinal drugs since ancient times. The World Health Organization encourages the use of alternative medicine in treatment due to its lack of side effects and its cheaper price compared to chemical drugs, but it requires that these medicinal plants be subject to studies to ensure their effectiveness and the absence of side effects (Organization, 2019). Several plants were studied on mice to determine the ability of using these plants as an anti-anemic, where the anemia was induced in mice by phenylhydrazine and fed and extracts of different plants at different concentrations showed no statistically significant differences on some chemical parameters (Ezeigwe et al., 2020).

Oxidative stress is created by non-enzymatic oxidation reaction during metabolism. Free radicals are key factors due to high reactivity and referred for production of reactive oxygen species. ROS in turn interfere the cellular processes and cause degeneration of cells and eventually of tissues. Oxidative pressure in erythrocytes is considered as crucial mechanism of hemolysis (Mirończuk-Chodakowska, Witkowska, & Zujko, 2018). Disruption of membrane integrity arises from fragility, dehydration as well as extended manufacturing of reactive oxygen species. Chronic hemolysis leads to lack of hemoglobin. These metabolic changes result in the depletion of essential nutrients and micronutrients which are required for correct cellular function. In the prospective of it antioxidant activity was performed which shown 76.6, 63.05, 49.5 for Halilah, 78.6, 63.6, 48.7 for Balilah, 80.9, 64.6, 48.4 for Jamun 78.7, 63.7, 48.8 for, Amla, 80.3, 65, 49.7 for Filfilsiyah, 82.8, 65.8, 48.9 for Elaichikalan, 75.9, 61.8, 47.8 for Zeerah and 88.0, 70.9, 53.8, 36.8 for positive control percentage inhibition, where the tapering of dose sequentially reduced the inhibition percentage and as lower IC_{50} reflects higher DPPH scavenging activity.

CONCLUSION:

This study proved the effectiveness of alternative medicine in treating induced anemia using phenylhydrazine (PHZ), which is responsible for the breakdown of red blood cells. This may be due to the fact that these plants contain act as antioxidants that protect cells from being affected by external factors. Therefore, it is recommended to use medicinal plants in the treatment of anemia after being subject to further studies on a larger scale. P value was <0.05 which shown the significance of activity.

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Conflict of Interests Declaration

In relation to the research, authorship, and/or publication of this work, the authors disclosed no conflicts of interest.

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REFERENCES

4. Adwas, A. A., Elsayed, A., Azab, A., & Quwaydir, F. (2019). Oxidative stress and antioxidant mechanisms in human body. *J. Appl. Biotechnol. Bioeng, 6*(1), 43-47.
5. Di Meo, S., & Venditti, P. (2020). Evolution of the knowledge of free radicals and other oxidants. *Oxidative Medicine and Cellular Longevity, 2020*.
6. Ezeigwe, O. C., Nzekwe, F. A., Nworji, O. F., Ezennaya, C. F., Iloanya, E. L., & Asogwa, K. K. (2020). Effect of aqueous extract of F. capensis leaves and its combination with C. aconitifolius leaves on essential biochemical parameters of phenylhydrazine-induced anemic rats. *Journal of Experimental Pharmacology*, 191-201.

7. Karuna, D., Dey, P., Das, S., Kundu, A., & Bhakta, T. (2018). In vitro antioxidant activities of root extract of Asparagus racemosus Linn. *Journal of traditional and complementary medicine, 8*(1), 60-65.
8. Malay, K. K., Duraisamy, R., Brundha, M., & Kumar, M. (2018). Awareness regarding anemia among 1 st year dental undergraduate students. *Drug Invention Today, 10*(8).
9. Melku, M., Alene, K. A., Terefe, B., Enawgaw, B., Biadgo, B., Abebe, M., . . . Melku, T. (2018). Anemia severity among children aged 6–59 months in Gondar town, Ethiopia: a community-based cross-sectional study. *Italian journal of pediatrics, 44*(1), 1-12.
10. Michel, J.-B., & Martin-Ventura, J. L. (2020). Red blood cells and hemoglobin in human atherosclerosis and related arterial diseases. *International Journal of Molecular Sciences, 21*(18), 6756.
11. Mirończuk-Chodakowska, I., Witkowska, A. M., & Zujko, M. E. (2018). Endogenous non-enzymatic antioxidants in the human body. *Advances in medical sciences, 63*(1), 68-78.
12. Organization, W. H. (2019). *WHO global report on traditional and complementary medicine 2019*: World Health Organization.