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HERBAL TABLET OF CARDIOL VATI AND ITS X-RAY POWDER DIFFRACTION (XRPD) ANALYSIS.

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ABSTRACT

Ayurveda is a medicinal system which used metals and minerals in the form of bhasma, Tablets, Elixirs etc. Cardiol Vati is one of such medicines which is used for the therapeutic treatment on Cardiac disease. Modern techniques such as X-Ray Diffraction (XRD), Scanning Electron Microscopy (SEM), Energy Dispersive X-ray Analysis (EDAX), Infrared spectroscopy (IR), Thermogravimetric Analysis (TGA), Inductively Coupled Plasma-Optical Emission Spectroscopy (ICP-OES) and Transmission Electron Microscopy (TEM) were used to generate Physico-chemical studies of Herbal medicines.[1] These herbal medicines commercially available in market and are used for treating various diseases in Indian traditional clinical practice. In the present study, the method is developed for the analysis of the different elements or inorganic contents of herbal medicines. The present study showed that the metals in this preparation are below the toxicity limit. Powder X Ray Diffraction (PXRD) was used to fingerprint a particular phase or mixture of phases. In fact, it is a very important tool in the pharmaceutical industry for checking the presence of polymorphism and Inorganic elemental analysis which is equally important from the enzyme part of function.

KEYWORDS: X-Ray Diffraction (XRD), Scanning Electron Microscopy (SEM), Energy Dispersive X-ray Analysis (EDAX), Infrared spectroscopy (IR), Thermogravimetric Analysis (TGA), Inductively Coupled Plasma-Optical Emission Spectroscopy (ICP-OES) and Transmission Electron Microscopy (TEM).

INTRODUCTION

X-Ray Powder Diffraction (XRPD) shows the direct information regarding the elements and their physicochemical properties. It is very important technique in the pharmaceutical industry, sensitive method as a phase characterization, polymorphism. Particle size affect the absorption, efficacy of the herbal drugs. Herbal Tablet of Cardiol Vati Samples (Details Given in table number -2.) was scan for the X-Ray powder diffraction by using X-ray diffractometer (***Rigaku, Model-Miniflex II***). Inorganic element studied by X-Ray Powder Diffraction by using inorganic oxides as a standard and to study the XRPD pattern by comparing with standard pattern. A number of modern technologies are used to know the Showing 2 θ (°) value of three strongest peaks of material characterization of Herbal medicines and can used as fingerprint in quality control of herbal medicines. Among them XRD analysis for Cardiol Vati is one of the important technique by which compounds of material and free metals etc. can be detected. Herbal tablet is safe for human consumption. World Health Organization (WHO) states that around 85-95% of the world population uses traditional herbal medicines. Most of the people use herbal medicines for less toxicity and side effects which are now available in different forms like tablets, elixirs, Tonic and powders.[2] Herbal medicines have become more popular as alternative and supplementary remedies in recent years. Contamination or adulteration of herbal medicines with toxic metal, essential elements, trace elements is of major concern. The poor quality control of these medicines causes health hazards. Some medicines may present unusually high concentrations of Toxic elements that could lead to fatality if consumed for a longer time.[3] WHO (2007)[4, 5] gives some guidelines for the preparation of herbal medicines and listed some methods for the standardization of herbal medicines (WHO, 2011)[4,5] and also give maximum permissible limit of heavy metals (The Merck index, 1989)[6] and quality controlled norms. Therefore, it is imperative to label Inorganic element quantities on these medicines. Various instrumental methods like XRPD-Ray diffraction[7], ICP-MS[8] were used for standardization of herbal medicines which maintained the quality and contain well defined constituents required for reliable beneficial therapeutic effects.

MATERIAL AND METHODS

Common instrumental parameters

Samples*:* By taking the weight of Cardiol vati each tablet on digital balance is gently ground to fine powder using mortar and pestle at room temperature and packed in butter paper until

analysis. X-ray diffractometer (***Rigaku, Model-Miniflex II***) instrument was set up as follow then sample of Cardiol Vati was scanned. Parameters are given in table number -1.

Table 1: XRD parametr.

Sr. No	Parameter	Values
1	X-ray	Cu / 30 kV / 15 mA
2	Div Slit	1.25 deg
3	Sct Slit	1.25 deg.
4	Rec Slit	0.3mm
5	Scan mode	Continuous
6	Scan speed	5.000 deg./min
7	Sampling width	0.020 deg.
8	Scan axis	2theta/theta
9	Scan range	10.000 -> 80.000 deg.
10	Theta offset	0.000 deg.

Table 2: Tablet name with company name and plants as per labe.

Sr. No	Brand and Company Name	Medicines Name	Plants as per label *
1	Safe life (Mfg. Lic.No-NKD/ AYU 82)	Cardiol Vati	Suthi, Arjun ghan ,Punarnava, Bringrajn,Abhrak bhasma, shuddha shiljit , Amalki ghan ,Guduch ghan , Gokshur ghan ,Akik pisti,

Figure 1: Cardiol Vati.

Figure number 1 shows the Cardiol Vati Sample with label, Tablet and Powder form.

Cardiol Vati- Application

Heart is the most important organ of the circulatory system which nourishes the whole body by supplying pure blood. Obviously abnormal heart function lead to serious problems. Heart is made up of muscle fibers. Any abnormality in the constitution of heart and the other factors like blood, mind and Oja give rise to diseases related to heart. Cardiol vati helps to reduce

cholesterol and triglyceride level in blood. It also tones the cardiac muscles and improves the function of heart. (Information collected from the leaflet provided with sample).

RESULT AND DISCUSSION

Biological Application of Calcium, Manganese and Magnesium.

Manganese

Manganese is required for Photosynthetic Oxygen evolution and plays an important role in several metabolic processes such as bone growth, glucose tolerance, reproduction and development of inner ear.[9] Manganese is an important element for human health, essential for development of metabolism, and the antioxidant system. It is also important in photosynthetic.[10]

Calcium

calcium is not only necessary for the formation of bones and teeth, but also critical for transmission of nerve impulses, blood clotting, and muscle contraction. The excess calcium in the body, is pretty uncommon, but can come from excessive consumption of calcium-rich foods, certain bone diseases or extreme inactivity e.g., quadriplegic/paraplegic conditions where the bones bear no weight. Symptoms may include digestive problems and nausea in minor cases, but can cause brain dysfunction, coma or even death in extreme instances. Deficiency of calcium may not cause immediate symptoms, but over time can also affect the brain, leading to delirium, memory loss and depression; severe cases may lead to muscle spasms, seizures and abnormal heart rhythms.[10]

Magnesium

Magnesium is the most abundant element in the body. It is essential for life and include in biological and enzymic reaction. Magnesium involved in the hydrolysis of many biological important phosphate derivatives such as ATP to ADP+ Pi.[9] Magnesium is necessary for over 300 biochemical reactions in the body, it also plays an important role in the synthesis of both DNA and RNA, essential to every cell of every known living organism. The fourth most prevalent mineral in the human body, magnesium helps maintain normal nerve and muscle function, boosts the immune system, maintains stable heart rate, stabilizes blood sugar, and promotes the formation of bones and teeth. Magnesium toxicity can occur in cases of kidney failure or excessive supplementation, however, and may lead to nausea, vomiting, impaired breathing or irregular heartbeat.[10]

Table 3: **Ion Concentration in Extracellular Blood Plasma.**[9]

Sr. No	Ion	Ion Concentration in Blood Plasma
1	Ca (calcium)	3mM
2	Mg (Magnesium)	1mM

XRPD measurements are performed for Sample B Cardiol Vati an analytical instrument with Cu Kα1 radiation with highly sensitive solid state detector. The X-ray tube operated at Cu/ 30kv and 15mA. XRPD analysis of Cardiol Vati Shows the highest peak at 24.56 °, 26.78 °, 30.26 °, 31.86 °, 32.94 °, 35.98 °, 38.42 °, 39.76 °, 49.58 °, 50.56, 2 thetas as shows in figure 1(Cardiol Vati graph), and figure 2 shows the standard graph (Metal Oxide graph).

Table 4: Strongest XRD peaks of Cardiol Vati.

Sr. No	2 Theta Degree
1	24.56
2	26.72
3	31.82
4	32.88
5	35.82

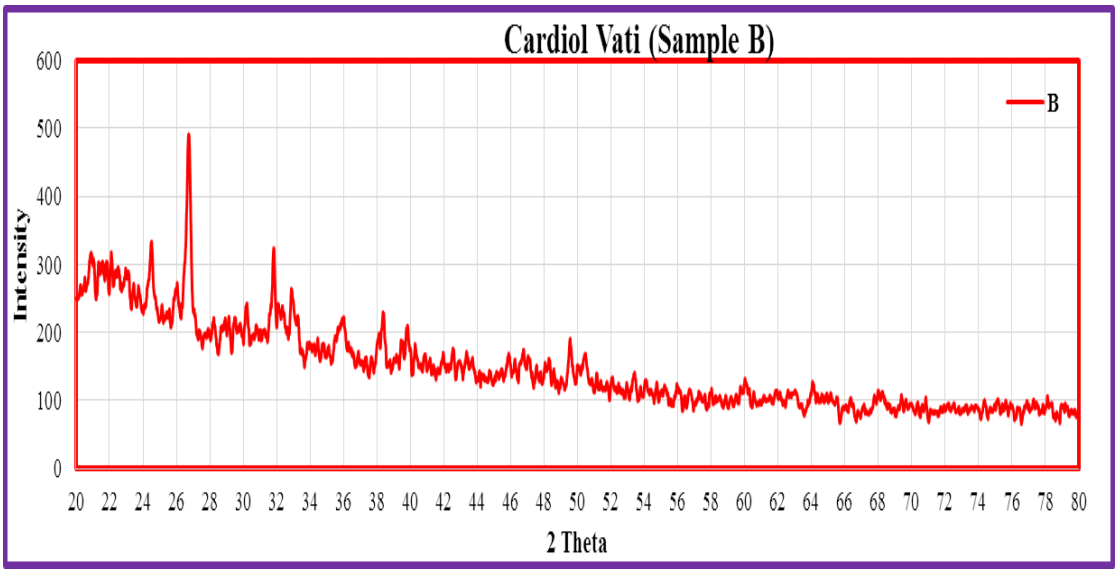

Figure 2: Cardiol Vati Graph.

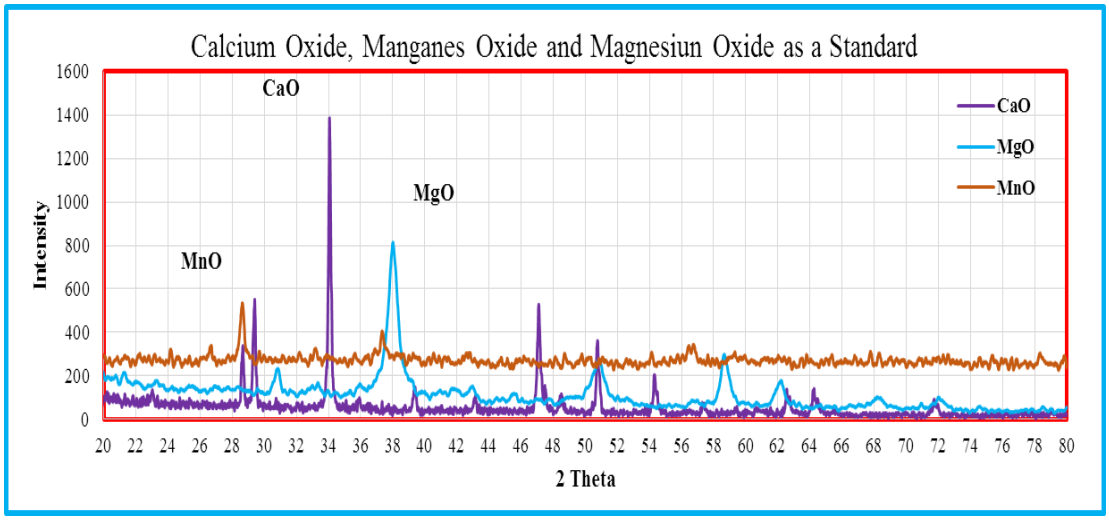

Figure 3: Metal Oxide Standard Graph.

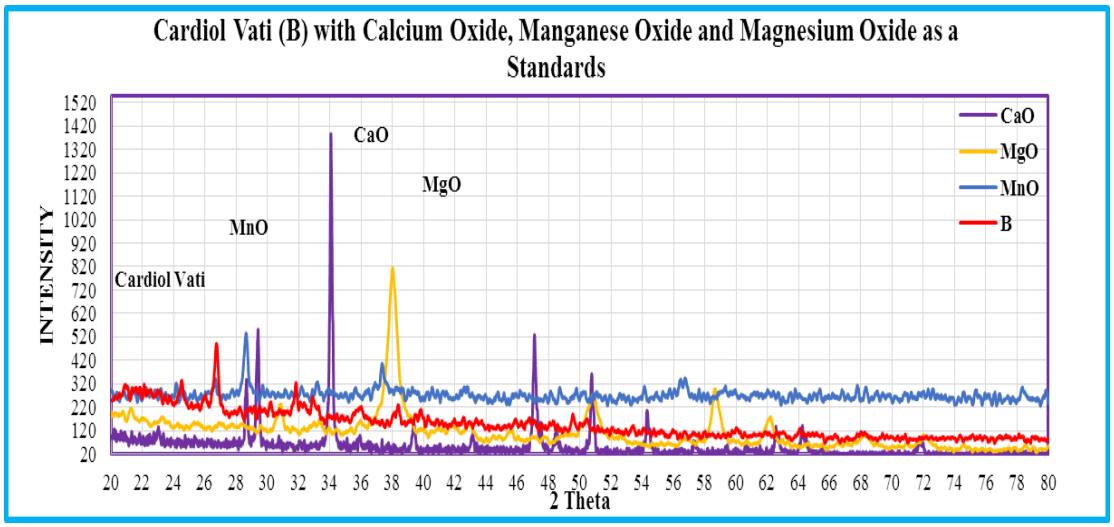

Figure 4: Metal Oxide Standard Graph Cardiol Vati (B).

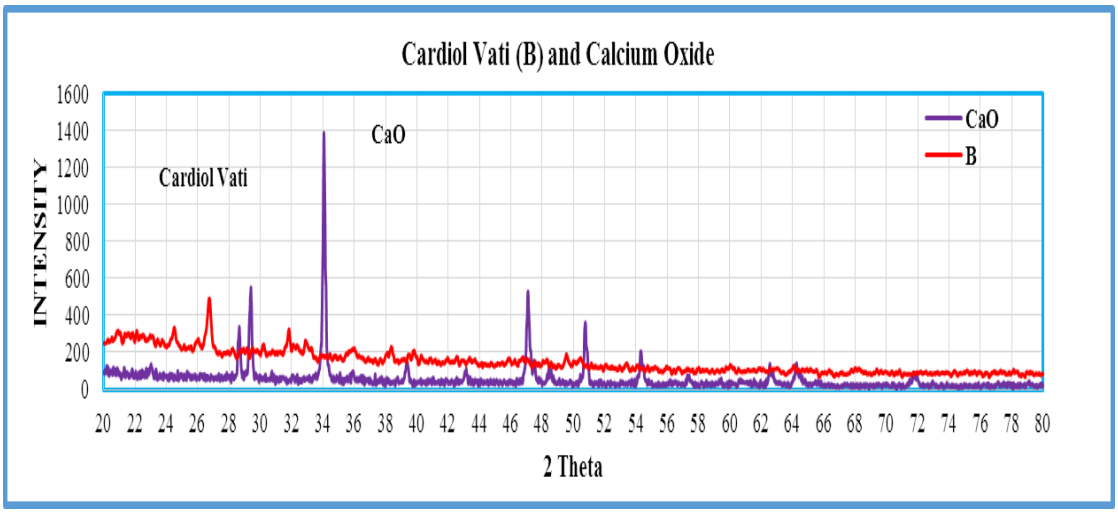

Figure 5- Cardiol Vati and Calcium Oxide XRD Graph

Table 5: Strongest XRD peaks of Calcium Oxide.

Sr. No	2 theta Degree
1	28.66
2	29.42
3	34.06
4	47.12
5	50.78
6	54.3

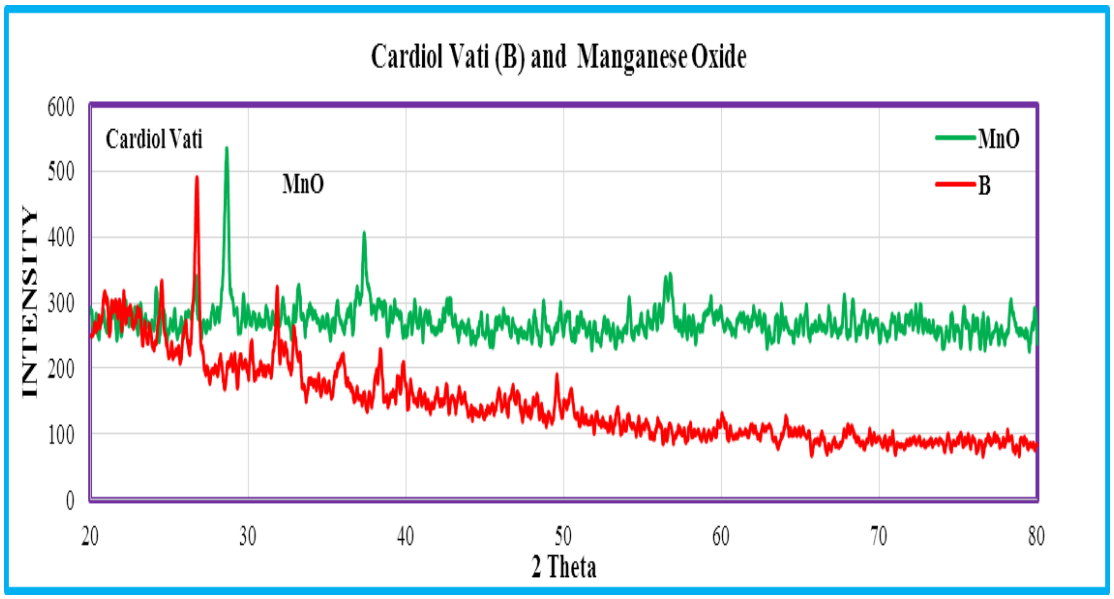

Figure 6: Cardiol Vati and Manganese oxide XRD Graph.

Table 6: Strongest XRD peaks of Manganese Oxide.

Sr. No	2 theta Degree
1	24.56
2	26.88
3	28.66
4	37.34
5	54.88
6	56.76

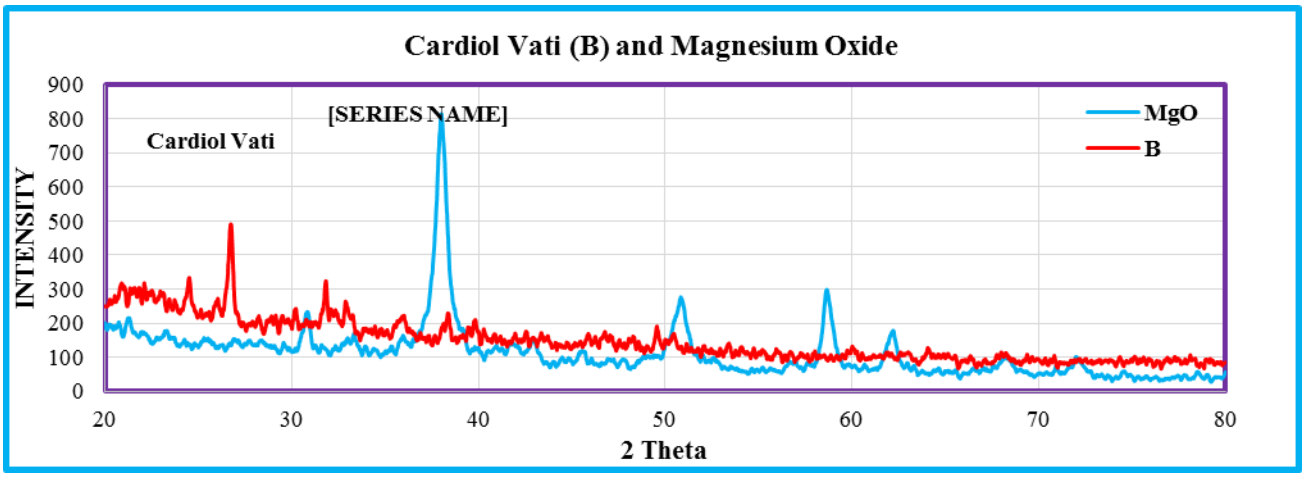

Figure 7: Cardiol Vati and Magnesium Oxide XRD Graph.

Table 7: Strongest XRD peaks of Magnesium Oxide.

Sr. No	2 theta Degree
1	30.76
2	38.04
3	43.16
4	50.96
5	58.72
6	62.28

Figure number 5, 6 and 7 shows the overlay XRPD Patter of Calcium Oxide, Manganese Oxide and Magnesium Oxide with Cardiol Vati respectively.

Table 8: Intensity and peaks values of Cardiol Vati at 2 Theta.

The maximum intensity of sample Cardiol Vati at 2θ		
Sr. No	**Intensity**	**Peak value**
1	24.54	323.194
2	26.78	475.852
3	31.82	323.801
4	31.84	323.695
5	32.98	248.224
6	38.4	227.798
7	49.58	108.694

Table 9: Standard XRD peak values of Metal Oxides at 2Theta[11]

Sr. No	Standard	AST 2 Theta Value	Reference
1	Calcium iron oxide	33.56	Standard X-ray Diffraction Powder Patterns Section 18 Data for 58 Substances
2	Manganese	42.95	
3	Magnesium Phosphate	29.68	

Table 10: Standard XRD peak and Intensity of Metal oxide at 2theta.

Sr. No	Compound	2 Theta value	Intensity
1	Calcium Oxide	18.02	888.214
		28.66	337.857
		29.4	551.071
		34.06	1384.64
		39.44	121.429
		47.08	512.619
		50.78	352.5
2	Manganese Oxide	28.62	535.026
		37.36	402.142
		54.16	302.142
		56.78	341.682
		78.3	301.851
3	Magnesium Oxide	18.64	585.346
		38	811.313
		50.9	270.188

CONCLUSION

Three elements Calcium (Ca), Manganese (Mn) and Magnesium (Mg) are quantitatively determining in Cardiol vati using most sensitive instrumental technique of XRPD (X-ray Powder diffraction) the data presented shows that the techniques should be made mandatory for the companies, marketing, herbal medicines.

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