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A Study on the Data Build for Smart Analysis of *Tinospora Cordifolla* (GURJO) by Deep Learning (1)

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Abstract: This paper focuses on how to AI apply to analysis of natural source of Tinospora Cordifolla (GURJO). To apply AI for analysis, the data is absolutely is needed. GURJO has a very good pharmacological effect for human well-being. *Tinospora Cordifolia* has chemical constituents like terpenoids, alkaloids, steroids, lignans, flavonoids and glycosides. Therefore, it has many pharmacological activities such as immunomodulation, anti-diabatic, antifungal, in hepatotoxicity (hepatic disorder), anti- cancer, anti-HIV potential, antitoxic effect, and in Parkinson disease because there are phenol and tannins saponins, glycosides, steroids, steroids. To analysis and use, we should know which natural source has impact and what relation among natural sources through data and AI based analysis to develop a new paradigm and products. This paper has the purpose data build for AI application for this purpose. Because AI Thinking has a multi-purpose meaning about various aspects of AI user and it has a wide range of the management, the production, the training, and use of AI systems, it is absolutely needed to try systematically to understand and learn. This paper has also purpose AI Thinking for practice, methodological, and context of GURJO.

Keywords: AI Application, Food, Tinospora Cordifolla (GURJO), Data, Smart food.

I. INTRODUCTION

Currently, AI covers all domains such as literature, fashion design, creation ideas, food analysis as well as engineering and technologies. Food engineering also quite important to analyze to produce a new product for better healthy food and new one. To do that, we have to know sources of natural quality and quantity for product and smart beauty development as well as healthy providing called herb. This paper is to find and analyze natural source of *Tinospora Cordifolia* called one of herb. Basically, natural sources are quite good for health condition and useful sources for other product like beauty material [1, 2, 3].

Tinospora Cordifolia is one of the medicinal herbs having vast benefit to human health called GUDUCHI. It is come under the climbing shrub, which belongs to family Menispermaceae and is inherent to India, China, Korea [5], and some parts of Australia and Africa. The plant is distributed throughout the tropical region of India up to 1,200m above sea level from Kumaon to Assam, in the north extending through West Bengal, Bihar, Deccan, Kankan, Karnataka, and Kerala. It is indigenous to areas of Nepal, India, Myanmar, Sri Lanka, China, Thailand, Philippines, Indonesia, Malaysia, Borneo, Vietnam, Bangladesh, North Africa, and South Africa. It is typically grown in deciduous and dry forests at elevations up to 1000ft. [7] In Nepal, it is distributed throughout the tropical region of altitude from 300m to 1200m above sea level. There are 15species of Tinospora. Out of which, only 4 species have been reported in India and two species have been reported in Nepal. [7] There are 4-species in Korea. It has its own pharmacological effect for human well-being [7, 8]. *Tinospora Cordifolia* has chemical constituents like terpenoids, alkaloids, steroids, lignans, flavonoids and glycosides. It has many pharmacological activities such as immunomodulation, anti-diabatic, antifungal, in hepatotoxicity (hepatic disorder), anti- cancer, anti-HIV potential, antitoxic effect, and in Parkinson disease. The family Menispermaceae consists of 75 genera, with 520 Species. The family Menispermaceae is highly specialized in its rich diversification of biologically active alkaloids [9]. Because of this richness, the plant family is used worldwide in traditional medicines to treat a wide variety of ailments (Martin et al., 2010). The main aim of this paper is to provide data building for AI based smart analysis for medical source development as well as other product development like beauty material and strong ant-cancer material.

II. ANALYSIS AND DESCRIPTION OF GURJO

A. Raw Material Collection

Fig. 1 shows the process for data building in this paper. The materials, equipment, and chemicals used in different stages

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of study are included below. *Tinospora Cordifolia* sample that is stem and leaf is collected from Rambha rural municipality word no.1 palpa which is 400 m altitude from sea level.

Preparation of *Tinospora Cordifolia* (stem/leaf) powder: Sample of leaf and stem of *Tinospora Cordifolia* was collected from Rambha rural municipality ward no.1 Palpa which is at 400 m. altitude from sea level. The sample was cut into small pieces to dry uniformly dried in the shade dry for 6 – 7 days then it was milled to make powder with 300 micro sieve size. The powder was packed in aluminum pouches and stored in a dry place.

Total flavonoid content was analyzed using the aluminum chloride colorimetric method) with some modifications. In this method, quercetin was used to make a standard calibration curve in the different concentration ranges of 0-100 µg/ml (10, 20, 40, 60, 80, and 100µg/ml). In different test tubes, each 1ml extract and 1ml standard solutions were placed, and then 1ml of 2% aluminum chloride, 3ml of 5% sodium acetate, was added and mixed well. The mixture was then centrifuged at 3000 rpm for 20 min to get a clear solution. A blank was prepared in the same manner where 1ml of distilled water was used instead of the standard or sample, and the amount of aluminum chloride was also replaced by distilled.

Moisture Analysis: The moisture content of the sample was determined by using the hot air oven method as the standard method of (AOAC, 2005). Fig. 2 is contents for analysis of the data build of *Tinospora Cordifolia* done in this paper

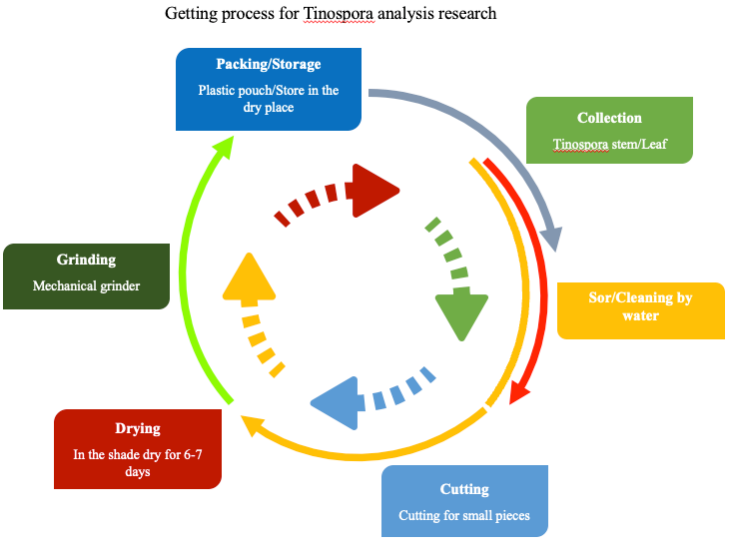

Fig. 1. Process for the data build of *Tinospora Cordifolia*.

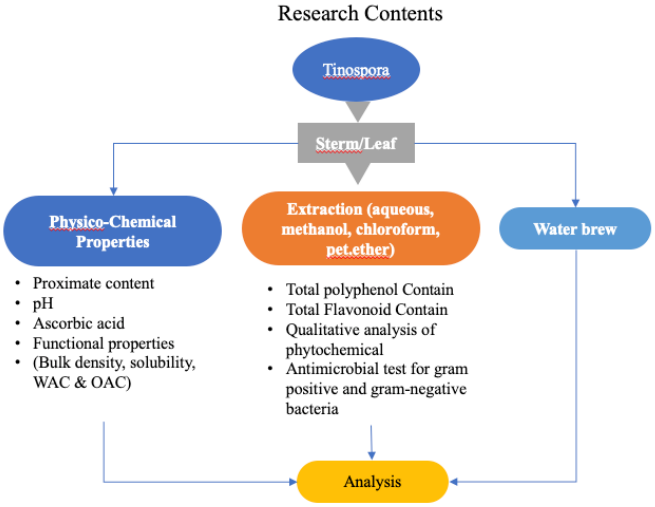

Fig. 2. Analysis of the data build of *Tinospora Cordifolia*.

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Crude Fat: The fat content was determined by the Soxhlet method. Solvent extraction of 10 g sample was done by recycling hot solvent several times until complete extraction and fat were recovered by evaporating away the solvent as the standard method of Ranganna (2010).

Crude Protein: The crude protein was determined by using Kjeldahl's method. 2 g fatless samples were digested, steam distillation after decomposing the former NaOH. Titration of entrapped NH3 boric acid was done with standard acid as the standard method of Ranganna (2010).

Crude Fiber: The crude fiber was determined by using a chemical process, the sample was treated with boiling dilute Sulphuric acid, boiling sodium hydroxide, and then with alcohol as the standard method of Ranganna (2010).

ASH Content: Ash content was determined using muffle furnaces according to Ranganna (2010). 5 g of weighed sample in silica crucible was charred in a hot plate till no smoke rise from it and finally, ashing was done in a muffle furnace at 550^0C to the constant weight. The difference in weight was the total ash content remaining in the crucible, under standardized conditions Ranganna (2010).

Carbohydrate: The total carbohydrate content of *Tinospora Cordifolia* stem/leaf powder was determined by different methods as per Ranganna (2010).

Acid Insoluble Ash (AIA): Acis Insoluble Ash content of *Tinospora Cordifolia* stem/leaf powder was determined by following the method given by Ranganna (2010).

pH: The pH was measured in a suspension resulting from blending 10g *Tinospora Cordifolia* stem/leaf powder with 10 mL of deionized water in a centrifuge for 2 min, using a digital pH meter (Viuda-Martos et al., 2012).

L-ASCORBIC Acid Content: The L-ascorbic acid content of *Tinospora Cordifolia* stem/leaf powder was determined by following the method given by (K.C et al., 2012).

Saponin: 10 ml lukewarm water was poured in uncrushed fresh and dried stem and leaf powder separately and shaken to see the formation of a foamy substance known as saponin. Also, a little dilute hydrochloric acid was added to facilitate the formation of saponin. This was the test to confirm its presence. (Ejikeme et al., 2014).

Total Polyphenol Content: Total polyphenol content was estimated by Folin- Ciocalteau colorimetry as per (Kaimal et al., 2014).

Total Flavonoid Content: The absorbance of the standard and sample was taken at 440 nm. Results were expressed as mg quercetin equivalent (QE) per gram of extract. All analyses were carried out in triplicate. The percentage of total flavonoid content (TF) was calculated from the calibration curve of quercetin plotted, and total flavonoid content was expressed as milligram quercetin equivalent per gram extract. Total flavonoid content was calculated using the formula: TFC = Cx V/M Where, 'c' is the concentration of quercetin in mg/ml; 'V' is the volume of plant extract in ml; and 'm' is the weight of pure plant extract in gm.

Total Alkaloid Content: The quantification of alkaloids determinations was performed by standard methods [16]. 100 ml of 10% acetic acid in ethanol was added to 1 g of leaf extracts, and then the extracts were covered and allowed to stand for 4 hrs. After that the extracts were filtered and concentrated on a water bath to 25 ml of its original volume. The droplets of concentrated ammonium hydroxide were added to the extract until the whole solution was allowed to settle, and then the precipitates were washed with dilute ammonium hydroxide and then filtered using Whattman filter paper. The residue was dried in the oven at 40°C and weighed. The alkaloid content was determined using the following Formula.

Percentage of alkaloid = (final weight of the sample/initial weight of the extract) × 100. (Nithya et al., 2015).

Bulk Density: The bulk density of powder samples was determined by weighing the sample of 50 g into a 100 ml graduated cylinder, tapping ten times against the palm, and expressing the final volumes as g/ml (Nwosu and Justina, 2011).

Solubility: For the determination of solubility, 0.2g of powder sample was suspended in 10 ml of water in a 15 ml centrifuge tube of known weight. Then thus prepared sample was incubated in a water bath at 95 C. the dispersion was stirred intermittently over 30 minutes period. The tubes were rapidly cooled to 20^0C. the cool paste was centrifuged at 2200 x g for 15 minutes to separate the supernatant. The aqueous supernatant was poured into a tarred evaporating.

Water and Oil Absorption Capacity: For the determination of oil and water absorption capacity method described by Nwosu and Justina (2011) was used. For WAC suspension of 1 g powder and mixed with distilled water to make 10 ml dispersion in a clean and dry centrifuge tube of known weight. It was then centrifuged at 2000 rpm for 15 minutes. The supernatant was discarded and the tube with contents was reweighed as water absorbed per gram. The gain in mass is the water absorption capacity of the flour sample. Similarly, for OAC determination 2g sample was mixed with 20 ml of oil. Samples were allowed to stand 30^0C for 30 minutes then centrifuged at 1000 rpm for 30 minutes. The volume of

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supernatant in a graduated cylinder was noted. The density of water was taken to be 1 g/mL and that of oil was determined to be 0.9 g/mL.

Determination Zone of Inhibition (ZOI): Zone of inhibition was determined by Agar well diffusion method as given by Dingle et al, (1953) which was performed as Sterile Mueller-Hinton Agar (MHA) petri plates of approximately 4 mm thickness. were prepared Petri plates were dried on the hot air oven to remove excess moisture from the surface of the media The fresh inoculum, compatible with McFarland standard 0.5 was prepared Sterile cotton swab was dipped into the prepared inoculum and rotated and pressed against the upper inside wall of the tube above the liquid level and swabbed carefully all over the surface of the plate three times rotating the plate through an angle 600 after each application. Finally, the swap was passed around the edge of the Agar surface. The inoculated plate was left to dry for a few minutes at room temperature with the lid closed (WHO, 1991) Working suspensions were prepared by adding 50mg of an extract with 1ml of DMSO) Standard Neomycin was used as negative control and blank DMSO was used as a positive control. Then with the help of a sterile cork borer (6 mm diameter), wells were made in the swabbed Petri plate and labeled properly. Fifty µL of the working suspensions of the methanolic extract was dispensed in the respective wells with the help of the micropipette. At the same time, Neomycin and DMSO were tested for their activity as a control. The Petri plates were left for sometimes with the lid closed for proper diffusion of Petri plates were incubated at 37°C for 18-24 hrs: After incubation, the plates were observed for the zone of inhibition (Z0I), which is suggested by the clear area without growth of bacteria around the well. The ZOI was measured using the scale

Preparation of Standard Culture Inoculums: Three or four colonies of bacteria were transferred to the test tube containing 5 ml of sterile nutrient broth. It was incubated at 37° C for 3 hrs. The turbidity of the inoculum was matched with Mcfarland Nephelometer standard 0.5.

Preparation of Media: The media used in the study were prepared according to the manufacturer's recommendation.

Nutrient Agar: 28 grams of media were suspended in 1000 ml of distilled water and heated to dissolve the media. The media was autoclaved at 15 lbs. pressure at 100^0C for 15 minutes.

Nutrient Broth: 13 grams of media were suspended in 1000 ml of distilled water and heated to dissolve the media. The media was autoclaved at 15 lbs pressure at 121^0C for 15 minutes.

Muller-Hinton Agar: 38 gram of media was suspended in 1000 ml of the water bottle to dissolve and sterilized by autoclaving at 15 lbs pressure at 121^0C 15 minutes. 25 ml of media was poured in each sterilized petri-plates (9cm diameter) to ensure uniformity in the depth of the medium. In this study screening of antimicrobial activity (determination of zone of inhibition) was performed by Agar well diffusion method (Albuquerque et al., 2006).

Qualitative Analysis for Phytochemical: The plant methanolic extracts were screened for the presence of the phytochemical classes by using the standard following methods (Jaradat et al., 2015)

a) Test for phenol and tannins: Two milliliters of 2% solution of $FeCl_3$ mixed with crude extract. Black or blue-green color indicated the presence of tannins and phenols.
b) Test for flavonoids: Shinoda test: A pieces of magnesium ribbon and HCl concentrated were mixed with crude plant extract after few minutes pink colored scarlet appeared that indicated the presence of flavonoids
c) Test for saponins: Five milliliter of distilled water was added to crude plant extract in a test tube and it was shaken vigorously. The foam formation indicated the presence of saponins.
d) Test for Glycosides: Liebermann 's test: 2 ml of acetic acid and 2 ml of chloroform mixed with entire plant crude extract. The mixture was then cooled and added H_2SO_4 concentrated, green color indicated the entity of aglycone steroidal part of glycosides.
e) Test for steroid: Two milliliter of chloroform and concentrated H_2SO_4 were mixed with the entire plant crude extract. In the lower chloroform layer produced red color that indicated the presence of steroids. Another test was performed by mixing 2 ml of each of acetic acid with H_2SO_4concentrated and crude extract with 2 ml of chloroform. Green color indicated the entity of steroids.
f) Test for terpenoids: Two milliliter of chloroform was mixed with the plant extract and evaporated on the water path then boiled with 2 ml of H_2SO_4 concentrated. A grey color produced indicated the entity of terpenoids.
g) Test for alkaloids: To 2.0ml filtrate of plant drug extract, 2.0ml of reagent was mixed. Formation of reddish- brown precipitate indicated the presence of alkaloids.

Sensory Evaluation for a Brew of GURJO (Sterm and Leaf): The Brew was prepared by shocking 5 min at 80–90-degree temperature Sensory attributes like Appearance, Odor, Mouthfeel, and final acceptability of Gurjo brew were evaluated based on a 5-point rating scale by 20 selected semi-trained food technologists including students, teachers, and staff of Lalitpur Valley College. Randomization for the sample was carried out by providing a different 3-digit number for every sample for every panelist. Also, water was provided to the panelist to rinse the mouth. The specimen card for sensory analysis is given in appendix III. (kawalski et al., 2019)

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B. Harvest for Data (Photo)

There are some photos for collection of materials in this paper, above.

C. Physical Observation of *Tinospora Cordifolia* (GURJO) Powder (Stem/Leaf)

The physical observation was done manually. Color, Odor, and appearance were observed as Green, Creamy brown, Odor (Metallic Woody), Green in fine powdered form). On the physical observation of *Tinospora Cordifolia*, its stem and leaf powder were found to be green and creamy brown respectively. Leaf's odor was found to be metallic and stem's odor was found to be woody. Leaf's appearance was found to be green in fine powder form and the stem's appearance was found to be the creamiest brown in powder form. Sharma (2019) reported a similar observation as presented above.

D. Qualitative analysis of phytochemical of *Tinospora Cordifolia* (GURJO) powder (stem/leaf)

TABLE I QUALITATIVE ANALYSIS OF PHYTOCHEMICAL OF *TINOSPORA CORDIFOLIA* (GURJO) POWDER

Phytochemical Solvent	Alkaloid	Flavonoid	Phenols and tannins	Saponins	Glycosides	Steroid	Terpenoid
Aqueous	+	+	+	-	-	+	-
Methanol	+	+	+	-	+	+	+
Chloroform	+	-	-	-	+	-	-
Hexane	-	-	-	-	+	+	+

Note. (+ sign indicate presence and – sign indicate absence of compound)

A preliminary phytochemical screening assay was conducted by using aqueous, methanolic, chloroform, and hexane extract using standard procedure. Results revealed the presence of alkaloid, terpenoid, steroid, saponin, tannin, flavonoid, glycoside, and phenol. Methanol extract showed more phytochemicals than that of another solvent. Preliminary phytochemical screening assay proved that *T. cordifolia* leaf extract is rich in primary and secondary constituents

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(Shrestha *et al.,* 2021)

Prawala (2018) reported the positive results of alkaloid on all four solvents were as the negative results of flavonoid reported on all four solvents. He reported positive results for methanol and hexane solvent, on the other hand, aqueous and chloroform had negative results. For saponin, all four solvents had negative results. Methanol and hexane solvent showed positive results for glycosides, steroids, and terpenoids. Chauhan *et al*., (2018) reported positive results of saponin, alkaloid, phenols, tannins, steroids, and flavonoid in water extract, whereas ethanol extract showed positive results for all components except steroids.

E. Functional property of *Tinospora Cordifolia* (Gurjo) leaf and stem powder (stem/leaf).

The functional properties of *Tinospora Cordifolia* (Gurjo) leaf and stem were analyzed in terms of bulk density, water absorption capacity, oil absorption capacity, and solubility which is shown in the table 2.

TABLE II FUNCTIONAL PROPERTIES OF *TINOSPORA CORDIFOLIA* (STEM/LEAF)

Parameters	**Observation**	
	Stem	**Leaf**
Bulk density (g/ml)	0.54±0.0178[a]	0.38±0.001
Water absorption capacity (g water/g of dry sample)	2.32±0.0380 [a]	3.19±0.183 [b]
Oil absorption capacity (g of oil/ g of dry sample)	5.04±0.0931 [a]	1.632±0.182 [b]
Solubility	6.76 ± 0.186 % [a]	3.63±0.281% [b]

Note: Samples with different subscript in the same row represents significantly different from each other, (Value are mean ± SD of *Gurjo* stem and leaf powder sample)

Bulk Density: T-test showed that there was a significant difference($p \leq 0.05$) on the Bulk density of stem and leaf. The bulk density of stem and leaf was found to be 0.541±0.017 (g/ml) and 0.38±0.001 (g/ml) respectively. Bulk density of Gurjo was found to be 124.15 kg/m3 which is greater than that of tea i.e 65.50 kg/m3 (Kushwaha, 2015). The variation in result between tea and Gurjo in bulk density was increased with a decrease in the size of powder particles.

Oil Absorption Capacity: T-test showed that there was a significant difference($p \leq 0.05$) on the oil absorption capacity of stem and leaf. In this study oil absorption capacity of stem and leaf was found to be 5.0413±0.0931 (g of oil/ g of dry sample) and 1.632±0.182(g of oil/ g of dry sample) respectively. These results were similar to that of Camellia sinensis i.e 1.54 (g of oil / g of dry sample) (Zhang et al., 2013).

Water Absorption Capacity: T-test showed that there was a significant difference($p \leq 0.05$) on the water absorption capacity of stem and leaf. The water absorption capacity of stem and leaf was found to be 2.328±0.0380 (g water/ g of dry sample) which were within the range of recommended WAC values, i.e., 1.49–4.72g/g for viscous foods (Oshodi et al., 2020). These results were similar to that of Zhang et al., (2013) who reported WAC of Camelia sinensis as 1.26 (g of oil / g of dry sample).

Solubility: T-test showed that there was a significant difference($p \leq 0.05$) on the solubility of stem and leaf. It was found to be the solubility of Gurjo stem and leaf was 6.763 ± 0.186 % and 3.63±0.281% respectively. The WSI characterize the interaction of the extruded product with water and are often important indicators that affect subsequent processing of feed (drying, storage, etc.) They also measure the degree of conversion and transformation of starch during the extrusion process. The WAI index can be used to determine the degree of gelatinization since native starch does not absorb water at room temperature (Apostol, 2015).

F. Chemical composition of *Tinospora Cordifolia* powder (stem and leaf)

Moisture content, Crude fiber, Crude fat, crude protein , carbohydrate and Total Ash of *Tinospora Cordifolia* stem/leaf powder were determined as described by Ranganna (2010). And Following results were obtained**.**

TABLE III CHEMICAL PROPERTIES OF GURJO (STEM AND LEAF)

S. N	**Parameters**	**Content**	
		Stem	**Leaf**
1	Moisture Content	7.50±0.1 [a]	15.61±0.15 [b]
2	Crude fiber	20.49±0.49 [a]	15.64±0.32 [b]
3	Crude fat	1.22±0.34 [a]	1.98±0.004 [b]
4	Total Ash	5.54±0.25 [a]	0.83±0.01 [b]
5	carbohydrate	60.18±0.61 [a]	49.66±0.62 [b]
6	Crude protein	5.05±0.09 [a]	16.26±0.37[b]

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Note: Samples with different subscript in the same row represents significantly different from each other, (Value are mean ± SD of *Gurjo* stem and leaf powder sample).

Crude Fat: T-test showed that there was a significant difference($p \leq 0.05$) on the crude fat content of stem and leaf. The crude fat content of dry stem was found to be 1.22±0.34%, which was similar to that of Masrat et al., (2018). Similarly, Sansthan et al., (2014) found 0.912%. Similarly for leaf crude fat content was found to be 1.98±0.004% which was less than that of Harbinger (1994) who revealed that Giloe contains content of 3.1%. Similarly, Geeta et al., (2013) found fat**,** 0.14 g/100 g. The presence of low crude fat means *Tinospora Cordifolia* could be used as a nutritionally valuable and healthy ingredient to improve poultry health and growth performance. Low-fat foods are known to reduce cholesterol levels (Gordon et al., 2002).

Crude Protein: T-test showed that there was a significant difference($p \leq 0.05$) on the crude protein content of stem and leaf. The protein content of the stem of *Tinospora Cordifolia* was found to be 5.05±0.09% which is less than that of Modi et al., (2021) who reported the protein content of the *Tinospora Cordifolia* as 8.6%. Similarly in the case of leaves of *Tinospora Cordifolia* protein content was found to be 16.26±0.37 which was similar to that of Kaur et al., (2016) i.e., 11.2%. Higher content of protein in leaf and stem of *Tinospora Cordifolia* suggests that *Tinospora Cordifolia* can be used as a protein supplement so may be used in the production of protein-enriched foods.

Crude Fiber: T-test showed that there was a significant difference($p \leq 0.05$) on the crude fiber content of stem and leaf. The crude fiber content of the dried stem was determined as 20.49±0.49, which differs from the research of Modi et al., (2021) who reported 26.99% of crude fiber in the stem. On the other hand, the crude fiber of leaf was 15.64±0.32, which is similar to the research of Sharma et al., (2013) who reported 16.10±0.11% of crude fiber.

Moisture Content: T-test showed that there was a significant difference($p \leq 0.05$) on the moisture content of stem and leaf. 7.50±0.1 moisture content of dried stem powder is significantly lower than 10.01% of the research of Modi et al., (2021). 15.61±0.15% of moisture content was observed in leaf of *Tinospora Cordifolia* which contradicts with the research of Pandey et al., (2016) who reported moisture content of stem of *Tinospora Cordifolia* as 9.64%.

Total ASH Content: T-test showed that there was a significant difference($p \leq 0.05$) on the total ash content of stem and leaf. The total ash of the stem of *Tinospora Cordifolia* was found to be 5.54±0. which is slightly lower than that of research of Modi et al., (2021) who reported Ash content of stem of *Tinospora Cordifolia* as 7.05 %. The total ash content of the leaf of *Tinospora Cordifolia* was found to be 0.83±0.01 which is lower than that of Manisha et al., (2016) who reported the ash content of the leaf of *Tinospora Cordifolia* as 5.880 %. These differences may be due to the difference in the season of harvesting and climatic condition.

Carbohydrate Content: T-test showed that there was a significant difference($p \leq 0.05$) on the carbohydrate content of stem and leaf.

The Carbohydrate of the stem of *Tinospora Cordifolia* was found to be 60.18±0.61 which is slightly higher than that of Modi et al., (2021) who reported carbohydrate of the stem in *Tinospora Cordifolia* as 46.11%. The Carbohydrate content of the leaf of *Tinospora Cordifolia* was found to be 49.66±0.62 which was higher than that of Pandey et al., (2016). These differences in leaf and stem may be due to differences in the composition of leaf and stem of *Tinospora Cordifolia*.

TABLE IV NUTRITIONAL VALUE OF DRIED LEAF AND STEM OF GURJO WITH ITS ENERGY VALUE

Parameter	**Stem**	**Leaf**
Moisture Content %	7.50±0.1	15.61±0.15
Crude fiber %	20.49±0.49	15.64±0.32
Crude fat %	1.22±0.34	1.98±0.004
Total Ash %	5.54±0.25	0.83±0.01
Carbohydrate %	60.18±0.61	49.66±0.62
Crude protein %	5.05±0.09	16.26±0.37
Nutritional value (Kcl)	277.45	324.06

From the above nutritional composition table, we can observe that 277.45 kcal energy is calculated in the *Tinospora Cordifolia* stem whereas 324 kcal is found in the leaf. From the above data, it can be said that the leaf of *Tinospora Cordifolia* is more nutritional compared to the stem of *Tinospora Cordifolia.*

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G. Ultimate analysis of dried stem and leaf powder *Tinospora Cordifolia*

TABLE V ULTIMATE ANALYSIS OF GURJO (STEM/LEAF) POWDER

Parameters	Stem	Leaf
L-ascorbic acid	4.36±0.30[a]	14.80±0.38[b]
pH	6.3±0.04 [a]	6.67±0.04 [b]
Acid soluble ash	5. ±0.11 [a]	0.74±0.03 [b]
Acid insoluble ash	0.19±0.03 [a]	0.036±0.02 [b]

Note: Samples with different subscript in the same row represents significantly different from each other, (Value are mean ± SD of *Gurjo* stem and leaf powder sample)

L-ASCORBIC ACID: T-test showed that there was a significant difference($p \leq 0.05$) on the L-ascorbic acid content of stem and leaf.

L-ascorbic acid of *Tinospora Cordifolia* was found to be 4.36±0.30 and 14.80±0.38 for stem and leaf respectively, which was similar to that of research of Modi et al., (2021) and Pandey et al., (2016) who reported 3.17% and 16% L-ascorbic acid for stem and leaf respectively. The higher amount of ascorbic acid in *Tinospora Cordifolia* increases iron absorption in the body. The vitamin C content was found to be similar compared to other vitamin-C rich plant sources (Anwar et al., 2007).

ACID INSOLUBLE ASH: T-test showed that there was a significant difference($p \leq 0.05$) on the acid insoluble ash content of stem and leaf.

AIA of Stem of *Tinospora Cordifolia* was found to be 0.19±0.032% which is slightly higher than that of Mahima et al., (2014) who reported 0.13% of AIA in its stem. AIA of the leaf of *Tinospora Cordifolia* was found to be 0.036±0.023% which was similar to that reported by Vijayakumari et al., (2018) who reported 0.032% AIA of *Tinospora Cordifolia* leaf. Jayawardhane et al., (2016) reported 0.4% AIA in Shrilankan tea leaves.

ACID SOLUBLE ASH: T-test showed that there was a significant difference($p \leq 0.05$) on the acid soluble ash content of stem and leaf. Acid insoluble ash was determined with the help of the subtraction method from total ash to acid-insoluble ash. ASA for stem and leaf was found to be 5.51±0.11% and 0.74±0.03% respectively. ASA of the stem was found to be higher than that of the leaf of *Tinospora Cordifolia*.

H. Crude extract of *Tinospora Cordifolia* (stem/leaf) powder

TABLE VI Crude extract of *Tinospora Cordifolia* (stem/leaf) powder

Solvent	Stem	Leaf
Petroleum ether	1.22±0.34 [a]	1.98±0.004 [a]
Chloroform	4.78±0.041 [a]	5.04±0.18[b]
Methanol	22.97±0.035 [a]	19.45±0.044 [b]
Water	2.58±0.17 [a]	3.14±0.093 [b]

Note: Samples with different subscript in the same row represents significantly different from each other, (Value are mean ± SD of *Gurjo* stem and leaf powder sample).

T-test showed that there was a no significant difference($p \leq 0.05$) on the crude extract of stem and leaf by using petroleum ether of stem and leaf. Crude extract of *Tinospora Cordifolia* was extracted with the help of petroleum ether. The yield of crude extract was 1.22±0.34 for stem extract and that for leaf extract was 1.98±0.004. Mahima *et al. (*2014) reported a value of 0.912 for leaf extract.

T-test showed that there was significant difference($p \leq 0.05$) on the crude extract of stem and leaf by using Chloroform of stem and leaf. The chloroform extract was found to be 4.78±0.041, 5.04±0.18 gram/ 100 gram for stem and leaf respectively. Dhawan *et al., (*2017) reported a 13.78% yield for chloroform extract of the *Datura metal* plant. T-test showed that there was significant difference($p \leq 0.05$) on the crude extract of stem and leaf by using methanol of stem and leaf. The methanol extract was found to be 22.97±0.035, 19.45±0.044 gram/ 100 gram for stem and leaf respectively. Methanol extract of moringa leaf powder was found to be higher than that of *Gurjo* (Omede *et al.,* 2016). T-test showed that there was significant difference($p \leq 0.05$) on the crude extract of stem and leaf by using water of stem and leaf. Water extract was found to be 2.58±0.17, 3.14±0.093 gram/100 gram for stem and leaf respectively. Mahdi *et al.* (2016) reported water extract of moringa leaf powder was less than that of *Gurjo* variation may be due to the difference in plant.

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Total Polyphenol Content (TPC) : T-test showed that there was a significant difference($p \leq 0.05$) on the polyphenol content of methanol extract of stem and leaf.

The total phenol content of methanol extract of *Tinospora Cordifolia* was found to be 401.39±1.57mgGAE/100 g, 661.40±1.54 mg GAE/100g for stem and leaf respectively which is higher than that of Modi *et al., (*2021*)* who reported TPC content of 154.464 mg/100g and 179.074 mg/100g in leaf and stem respectively.

T-test showed that there was a significant difference($p \leq 0.05$) on the polyphenol content of water extract of stem and leaf.

TPC of Water extract of *Tinospora Cordifolia* was found to be 502±1.16 mg GAE/100g and 632.72±1.25 mg GAE/100 g for stem and leaf respectively. TPC of the leaf was higher than that of the stem for water extract. Praveen *et al.,* (2012) at soul province Korea reported 60±0.50 mg/g variation in TPC may be due to the geographical difference.

TABLE VII TOTAL PHENOLIC CONTENT (TPC)

Solvent	**Stem (mg GAE/100 g)**	**Leaf (mg GAE/100 g)**
Methanol	401.39±1.57[a]	661.40±1.54 [b]
Water	502±1.16 [a]	632.72±1.25 [b]

Note: Samples with different subscript in the same row represents significantly different from each other, (Value are mean ± SD of *Gurjo* stem and leaf powder sample).

I. Total Flavonoid Content

TABLE VIII Total flavonoid content (TFC)

Solvent	**Stem (mg QE/100 g)**	**Leaf (mg QE/100 g)**
Methanol	1135.02±2.79 [a]	1237.055±2.19 [b]
Water	1374.915±1.05 [a]	1411.585±1.87 [b]

Note: Samples with different subscript in the same row represents significantly different from each other, (Value are mean ± SD of *Gurjo* stem and leaf powder sample))

T-test showed that there was a significant difference($p \leq 0.05$) on the Flavonoid content of stem on methanol and water extract.

The total flavonoid content of methanol extract of *Tinospora Cordifolia* was found to be 1135.02±2.79 mg QE/100 g, 1374.915±1.05 mg QE/100g for stem and leaf respectively which is higher than that of Alam *et al., (2020)* who reported TFC content of 852.07 mg/100g of *Tinospora Cordifolia* plant. Whereas Upadhyay *et al., (2021)* reported the flavonoid content of the methanolic leaf extract (20.94 mg QE/g) was lower as compared to the methanolic stem extract (23.82 mg QE/g) of *Gurjo*. The high flavonoid content was found to be positively correlated with the antioxidant activity. Variation in data may be due to the climatic condition as well as harvesting time.

T-test showed that there was a significant difference($p \leq 0.05$) on the Flavonoid content of leaf on methanol and water extract.

TFC of Water extract of it was found to be 1237.05±2.19 mg QE/100 g and 1411.585 mg QE/100g for stem and leaf respectively. TFC of the leaf was higher than that of the stem for water extraction. Upadhyay *et al., (2021)* reported that the total flavonoid content in the *Tinospora Cordifolia* plan was 1.13±0.02 mgQE/g, variation in data may be due to the harvesting and geological condition.

Total Alkaloid Content: The total alkaloid content of methanol extract of *Tinospora Cordifolia* was found to be

377.67± 2.49 mg /g, 395.33±1.24 mg /g for leaf and stem respectively which is higher than that of John *et al., (2014)* who reported TAC content of 23.58±0.16 mg/g of *J. adhatoda* plant. Variation in data may be due to the climatic condition as well as harvesting time as well as different in pant. Teng and Choi (2012) reported that total alkaloid content of *Rhizome Coptidis* 11.50 mg/g BCE/100 g. the different in data my be due to the different pant.

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TABLE IX TOTAL ALKALOID CONTENT

Total Alkaloid Content		
Solvent	**Stem (mg/g)**	**Leaf (mg/g)**
Methanol	395.33±1.24[a]	377.66±2.49[b]
Water	377.33±0.47[a]	362±0.81[b]

Note: Samples with different subscript in the same row represents significantly different from each other, (Value are mean ± SD of *Gurjo* stem and leaf powder sample)

Independent samples test analysis showed no significant difference between alkaloid content of leaf and stem at $p<0.05$.

J. Sensory evaluation

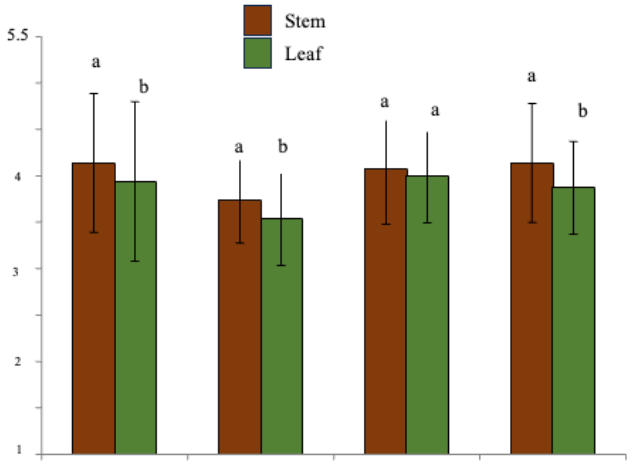

Fig.3 Acceptability test

Appearance: There was no significant difference $p<0.05$ in appearance between brew of Stem and leaf of *Tinospora Cordifolia*. The maximum value (3.13±0.02) and minimum value (2.93±0.04) was found for stem and leaf brew respectively. This may be due to the presence of low chlorophyll contained in the stem to that of the leaf which gave brown color to the stem and dark green color.

Odor: There was no significant difference $p<0.05$ in odor between the brew of stem and leaf of *Tinospora Cordifolia*. The maximum value (2.73±0.01) and minimum value (2.53±0.03) was found for leaf and stem brew respectively. This may be due to the presence of more aromatic compounds in the stem than that of the leaf.

Mouthfeel: There was no significant difference $p<0.05$ in mouth feel between brew of Stem and leaf of *Tinospora Cordifolia*. The maximum value (2.73±0.04) and minimum value (2.01±0.03) was found for leaf and stem brew respectively. This may be due to the bitterness of the leaf to that of the stem, bitterness increases with alkaloids.

Overall Acceptability: There was no significant difference $p<0.05$ in mouth feel between brew of Stem and leaf of *Tinospora Cordifolia*. The maximum value (2.73±0.03) and minimum value (2.53±0.01) was found for leaf and stem brew respectively. This may be due to the bitterness of lea to that of the stem.

K. Antibacterial Assessment: Both stem and leaf extract of *Gurjo* showed slight Zone Of Inhibition (ZOI) against S. aureus and B. cereus. Leaf extract had a ZOI of 4 and 6 mm against *S. aureus* and *B. cereus* respectively. stem extract had a ZOI of 4 and 6 mm against *S. aureus* and *B. cereus* respectively. Both stem and leaf extract of *Gurjo* showed no ZOI against E. coli. Standard Neomycin had a positive response against all three bacteria.

Praiwala *et al*. (2019) reported a very small ZOI against *E. coli* which is 0.3mm. Agrawal *et al*. (2019) reported a ZOI of 9mm against *S.aureus*. These differences may be due to variation in concentration of extract and extraction method as both publishers used vacuum evaporator for concentration which is more efficient than that of water bath.

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TABLE X ZONE OF INHIBITION OF GURJO AGAINST PATHOGENIC BACTERIA

Bacteria	Neomycin	Leaf	Stem
Staphylococcus aureus	14 mm	4 mm	4 mm
Bacillus cereus	24 mm	6 mm	6 mm
Escherichia coli	positive	negative	Negative

III. STRATEGY AND APPROACH FOR AI ANALYSIS OF GUROJ

How to get the data for AI application of this herb? Fig. 3 shows the component for AI application in this paper. Goal is what you are going to obtain through this AI and formulation presents how to work by AI. Then you can develop tool and AI related technologies that you are going to develop for your work. Of course, in this step you have to include model, S/W, and computational methods. Fig. 4 illustrates relation between AI and data including information to show effectively know representation by data.

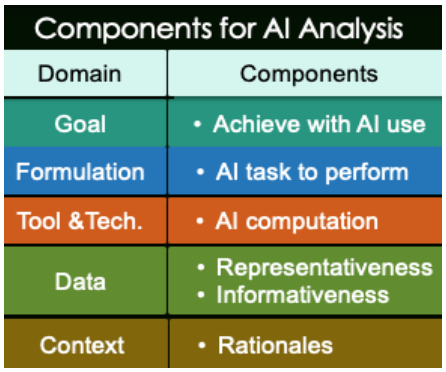

Fig. 4. Component for AI thinking.

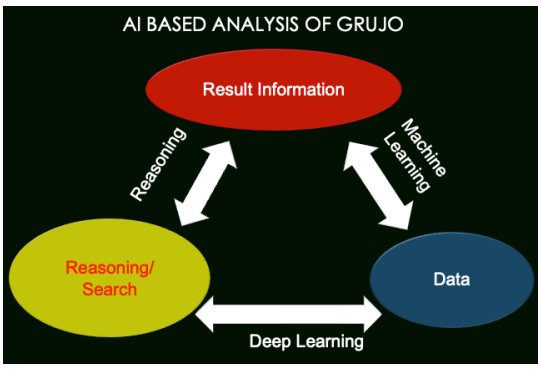

Fig. 5. AI and knowledge representation.

Because food sources are a so complex expression system but designers should express AI model by designer's idea. Of course, it is difficult to develop tools in experiment or scientific logic to fully address. That is why designer should try to implement in many reasoning and other ways.

You can find eloquently to show AI thinking from routines, patterns, hypothesis rules and operations more than the conventional ways. Fig. 6 illustrates the AI application by using AI Thinking for food application and Fig. 7 presents the final goal of AI application through data in this paper.

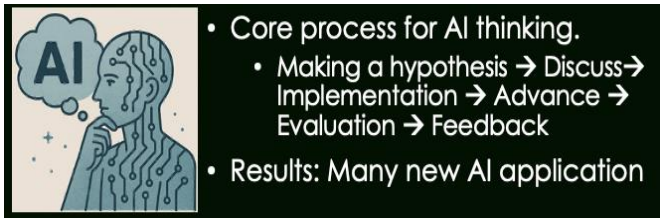

Fig. 6. Food application by AI thinking.

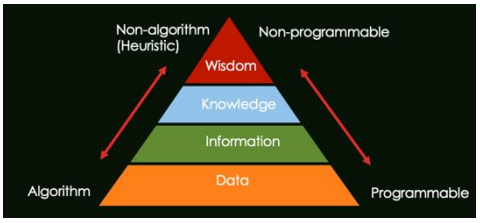

Fig. 7. The final goal of AI application through data.

Ref [3] examines the mind of human by questions relating to perception, drawing on the fields of philosophy, vision science and the theory of probability to answer how exactly we learn from our visual experiences of the world.

Ref [3] human tend to think that perceptual experiences tell us about what the external world is like without being influenced by our own mind," says Teng. "However, recent empirical research indicates that that's not true: our beliefs, expectations and other mental states can causally influence what we experience."

Ref. [4] investigates how presuppositions might affect perception and focus on the implications of any such influence for how we perceive the world, including art and even food.

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There are many ways to express information by AI. Knowledge of AI can be divided into various types of knowledge as shown in Fig. 8, each method serves a particular function in the process of knowledge representation: Declarative Knowledge; Procedural Knowledge; Meta Knowledge, Heuristic Knowledge, and Structural Knowledge. Users should select and decide through try and error to develop the best food source for typical food material. That is why this paper research for this herb.

Gurjo Characteristics:

Gurjo leaf could be used as a protein supplement due to high protein content 16.26±0.37. Gurjo Leaf and stem powder could be used to treat various diseases as it showed moderate antibacterial effect against tested bacteria.

Gurjo leaf and stem powder could be used in the preservation of oxygen sensitive food products because it contents high amount of antioxidant (polyphenolic compound) it decreased the rate of oxidation. It gives high calorific value so it can be used as a source for energy. Presence of high amounts of Total Phenols, alkaloids, steroids, glycosides, flavonoids and tannins.

Tinospora codifolia is a large, deciduous, extensively spreading, climbing shrub with several elongated twining branches. Leaves are simple, alternate, and exstipulate with long petioles up to 15 cm (6 in) long which are roundish and pulvinate, both at the base and apex with the basal one longer and twisted partially and halfway around. It gets its name Heart-leaved moonseed by its heart-shaped leaves and its reddish fruit. Laminae are broadly ovate or ovate cordate, 10–20 cm (4–8 in) long or 8–15 cm (3–6 in) broad, seven nerved and deeply cordate at base, membranous, pubescent above, whitish tomentose with a prominent reticulum beneath. Leaf and stem of *Tinospora Cordifolia* were collected from Rambha rural municipality Palpa.

The proximate values of crude fiber, crude fat, crude protein, moisture, ash, and carbohydrate for stem was found to be 7.50±0.1%, 20.49±0.49%,1.22±0.34%,5.54±0.25%,60.18±0.61% and 5.05±0.09%gm/100gm, respectively. While the same proximate, crude fiber, crude fat, crude protein, moisture, ash, and carbohydrate for leaf powder were found to be 15.61±0.15, 15.64±0.32, 1.98±0.004, 0.83±0.01, 49.66±0.62 and 16.26±0.37 gm/100gm leaf, respectively.

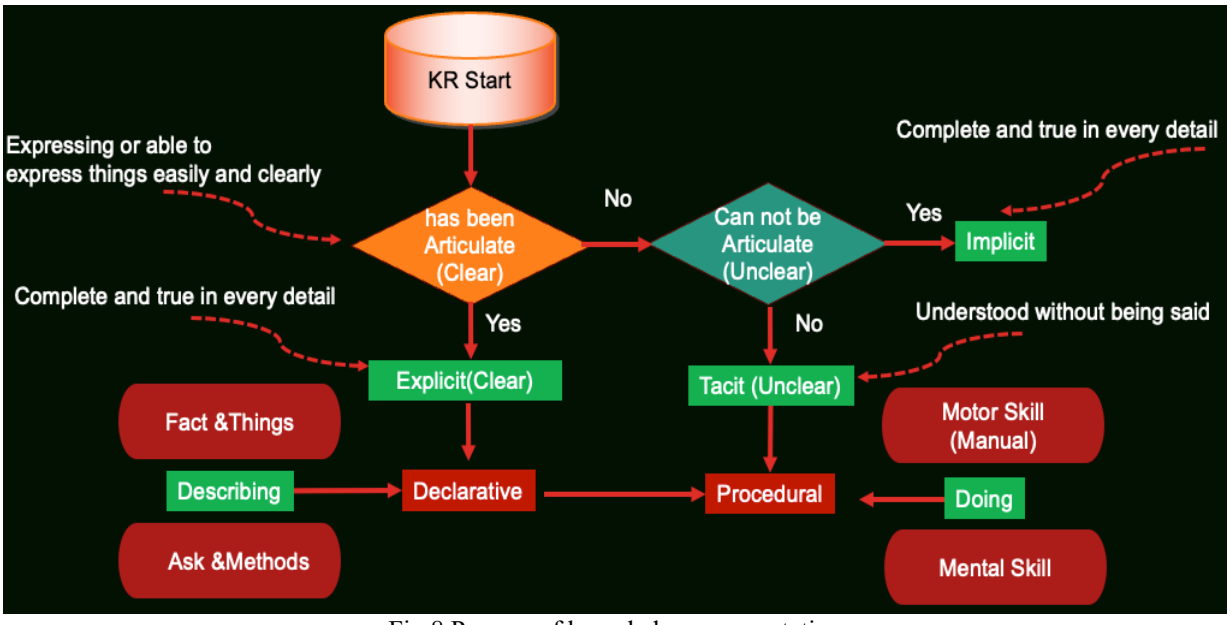

Fig.8 Process of knowledge representation

IV. CONCLUSION

Calculations were done on a dry basis, as the objective was to show the proximate content of the wholesome. Ultimate analysis was done which resulted in the l- ascorbic acid, acid-soluble ash, and acid insoluble ash content in stem and leaf to be 4.36 ±0.30, 6.3±0.04±0.04, 5.51±0.01, 0.19±0.032 and 14.80±0.38, 6.66±0.04, 0.74±0.03,0.03±0.02 gm/1 00gm, respectively.

Qualitative analysis of phytochemical was carried out by using pet. ether, chloroform, methanol, and squash which showed the presence of phenol and tannins saponins, glycosides, steroids, steroids. crude extract of *Tinospora Cordifolia (*Gurjo) leaf and stem was obtained using solvent viz pet. ether, chloroform, methanol, and aqueous which was found to be 1.22±0.34, 4.78±0.041,22.97±0.035,2.58±0.17 and 1.98±0.004, 5.04±0.18, 19.45±0.04,3.14±0.09, respectively. Total

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polyphenol content (TPC) was determined with standard gallic acid and was found to be 401.39±1.57,502.96±1.16 and 661.40±1.54,632.39±1.25 for stem and leaf using 70%methanol and water extract.

The Aim of AI Application

Traditional food and vegetable are only for eating and health sustain by the tradition ways. However, current technologies support a new domain to develop such as beauty, health material, tea, and or so. AI is the best tool for these technologies. To do that, we have to build the data for AI application. By using we can develop a new market and a new product. Fig. 4-8 shows well how we have to apply AI and why it is useful approach.

Especially, further study of this research and practice by AI can analyze more detailed Phytochemical screening of Gurjo and extraction of fungal endophytes. If further antifungal, antibacterial assessment in different solvent media by AI analyze and quantitative calculation of saponin, tannin, glycosides, steroid, terpenoids, pectin content, and various other phytochemicals by AI and data, we can obtain comparative analysis results of phytochemicals of different environmental conditions. It means that Gurjo Leaf and stem powder could be used to treat various diseases as it showed moderate antibacterial effect against tested bacteria, beauty material, and anti-cancer materials**.**

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BIOGRAPHY

Yogeswar Basyal received his B.Tech in Food Technology from Tribhuvan University, Nepal, completing a research thesis titled "Study on Physicochemical, Antimicrobial, and Nutritional Value of Tinospora cordifolia (Gurjo)." He is currently pursuing an M.Tech in Artificial Intelligence at Kathmandu University, Nepal. His research interests include applications of artificial intelligence in healthcare, food science, and agriculture, with experience in data science, machine learning, and medical image analysis.

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