



(RESEARCH ARTICLE)



Assessment of density and specific gravity tests of some selected *Ayurvedic* medicinal plants

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Abstract

The *Guna* (Static properties) in common terms known as properties or qualities. There are 41 *Gunas* in *Ayurvedic* classics. Among them the *Gurvadi Gunas* and *Paradi Gunas* are used in the various treatment measures. The *Guru* is known as heaviness. *Gurutwa* is correlated with Gravity in modern science. *Parthiva* and *Apya Mahabhuta* are responsible for this *Guru Guna*. The *Guru* drugs act as *Brumhana* (Nourishing as well as help to increase the mass of the tissues), *Anuloman* (Mild laxative). The exact opposite action of *Guru* drug is seen in *Laghu Dravya*. The *Laghu* drugs give Lightness to the body, as it is light in nature. The *Akashiya*, *Vayavya*, *Agneya*, *Laghu Gunas* are predominant in this drugs. These drugs act as *Agnideepan* (Appetizer), *Strotoshodhan* (Cleanses the channels). The more *Parthiva Dravya*, more the *Guru* can be considered. Less *Parthiva Dravya* more the *Laghu* can be considered. To assess the *Parthivatwa* by its correlation with Density and Specific gravity. Same can be considered for *Jaliyatwa* and *Vayaviyatwa*. Assessment of objective Parametric measures of *Guru* and *Laghu Guna* can be done by Density (Bulk), Specific Gravity (Liquid and solid). The Specific gravity, more formally known as relative density, is a measure of the density of a substance in comparison to the density of water. In this present research work there are 16 drugs for specific gravity for solids, 12 drugs for specific gravity for liquids, 20 drugs for Bulk density and the same 20 drugs for True density drugs have been selected.

Keywords: *Parthivatwa*, *Jaliyatwa*; *Guru*; *Laghu*; Specific gravity; Density; True density

1. Introduction

The Specific gravity *G* is defined as the ratio of the weight of an equal volume of distilled water at that temperature both weights taken in air. Density is calculated by mass per volume. The drugs for Specific gravity of solids were selected viz; *Asthishrankhala*, *Sariva*, *Vidari*, *Maricha*, *Shatavari*, *Jambu*, *Godhuma*, *Ushira*, *Ashwagandha*, *Nimba*, *Khadira*, *Tila*, *Kapikacchu*, *Bala*, *Yava*, *Dhanyaka*. The drugs for Specific gravity of liquids viz; *Kumari*, *Vidari*, *Sariva*, *Shunthi*, *Ikshu*, *Usheera*, *Kamala*, *Apamarga*, *Shatavari*, *Bala*, *Yava*, *Dhanyaka*. For Density tests drugs are; *Asthishrankhala*, *Sariva*, *Vidari*, *Maricha*, *Shatavari*, *Bala*, *Jambu*, *Godhuma*, *Usheera*, *Ashwagandha*, *Nimba*, *Khadira*, *Tila*, *Kapikacchu*, *Kumari*, *Apamarga*, *Jeeraka*, *Jatamansi*, *Yava*, *Dhanyaka*. Total 23 drugs have been selected for the experimentation.

The qualities of the above mentioned drugs are stated below;

- ***Asthi Shrankhala***^[1]- Cures *Vata*, *Kapha*, and heals the fracture. It is *Ushna veerya* (Hot in potency), *Sara* (Laxative), *Krimigna* (Vermifuge), *Arshogna* (Cures haemorrhoids), *Akshirogajit* (Useful in eye diseases), *Ruksha* (Drying), *Swadu* (Sweet), *Laghu* (Light), *Vrushya* (Aphrodisiac), *Pachana* (Digestive), *Pittala* (Increases Pitta). The stem is used along with *Masha* (Black gram) which is fried in *Tila Taila* (Gingely oil) can strongly acts as *Vata Shamaka* (Alleviates *Vata Dosha*)

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- **Sariva**¹²¹- *Sariva* is *Madhura*(Sweet), alleviate *Kapha, Vata, Rakta Doshas, Kustha*(Skin diseases), *Kandu*(Itching) *Jwara*(Fever), *Prameha*(Urinary diseases including diabetes), *Trishna*(Excess thirst), *Aruchi*(Loss of taste), *Raktapitta*(Bleeding diseases).
- **Vidari**¹³¹- *Vidari Kanda* is *Madhura*(Sweet) taste, *Snigdha*(Demulcent), *Brimhani*(Nourishing), *Sthany*, *Shukraprada*(Promotes breast milk and semen), *Sheeta Veerya*(Cold in potency), *Swarya*(Improves voice), *Mutrala*(Diuretic action), *Jivani*(Protects life), *Bala-Varnakara*(Tonic and enhances complexion). It is *Guru*(Heavy), *Rasayana*(Tissue vitalizer), *Veerya Vardhaka*(Increases semen), *Rasayana*(Tissue vitaliser), subsides aggravated *Vata, Pitta, Rakta* and *Daha*(Burning sensation).
- **Maricha**¹⁴¹- *Maricha* is *Katu*(Pungent in taste), *Teekshna*(Penetrating), *Dipana*(Appetizer), *Kapaha-Vatahara*(Alleviates *Kapha* and *Vata*), *Ruchikaraka*(Tasty), *Ushna*(Hot in potency), *Pittakara, Rooksha*(Drying), cures *Shwasa*(Dyspnoea), *Shoola*(Colic), *Krimi*(Worms), *Shukra Nashaka*(Decreases semen), *Agnijanaka*(Improves appetite). *Ardra Maricha*(Wet Pepper) is *Madhura Vipaka* (Sweet after end of digestion), *Natiushna*(Not much heat), *Kinchit Teekshna Guna*(Mild penetrating action), *Shleshma Praseki*(Mucogenic), *Apittalam*(Does not increase Pitta).
- **Shatavari**¹⁵¹- It is *Guru*(Heavy), *Sheeta Veerya*(Cold in potency), *Tikta*(Bitter) in taste, *Rasayana*(Tissue vitalizer), *Medhya*(Brain tonic), *Dipana*(Appetizer), *Balya*(Tonic), *Snigdha*(Demulcent) *Netrya*(Good for vision), *Gulma*(Intestinal growths), *Arsha*(Haemorrhoids). *Shukrala*(Promotes semen) and *Sthanya*(Breast milk), improves muscle tone and reduces *Vata, Pitta, Kapha* and *Rakta*.
- **Bala**¹⁶¹- *Bala* is *Sheeta Veerya*(Cold in potency), *Madhura Rasa*(Sweet), *Balya*(Tonic), *Varnakara*(Enhances complexion), *Snigdha*(Demulcent), *Grahi*(Absorbant), Subsides *Vata* and *Rakta, Pittasru Nashana*(Controls bleeding disorders), *Vrina ropana*(Heal wounds). The root bark of *Bala* is taken with milk and sugar helps to cure *Meha*(Polyurea) without any doubt.
- **Jambu**¹⁷¹- The *Jambu Phala* is *Vatavardhaka*(Aggravates *Vata Dosh*) *Grahi*(Absorbent), *Madhura*(Sweet), *Amla*(Sour), *Kapha-Pittahara*(Subsides *Kapha* and *Pitta Dosh*), The *Kshudra Jambu* smaller variety is *Kashaya*(Astringent), *Hridya*(Cardio tonic), *Kanthakasha*(Stretching in throat).]
- **Godhum**¹⁸¹- *Godhuma* is *Madhura*(Sweet), *Sheeta*(Cold in potency), *Guru*(Heavy), *Vata-Pittahara, Kapha* and *Shukraprada*(Increases *Kapha* and *Semen*), *Balya*(Tonic), *Snigdha*(Demulcent), *Sandhanakrit*(Helps to join the joints), *Sara*(Laxative), *Jeevana*(Life promoting), *Brimhana*(Nourishing), *Varnya*(Improves complexion), *Vrina*(Heals wounds), *Ruchya*(Tasty), *Sthiratwakrit*(Gives stability and stamina).
- **Ushira**¹⁹¹- The *Ushira* is *Sheeta Virya*(Cold in potency), *Tikta*(Bitter). It alleviate *Daha*(Burning sensation), *Kanti*(Improves complexion), *Vata Dosh*, *Jwara*(Fever), *Trishna*(Thirst), *Prameha*(Urinary disorders including diabetes), *Raktapitta*(Blood diseases). *Ushira* is *Durgandhahara*(Subsides bad smell), *Pitta Nashaka*(Subsides *Pitta Dosh*), *Snigdha*(Demulcent), *Tikta*(Bitter).
- **Ashwagandha**¹¹⁰¹- *Ashwagandha* subsides aggravated *Vata-Kapha*, Cures *Swhitra*(Vitiligo), *Shotha*(Edema), *Kshaya*(Emaciation), *Balya*(Promotes strength), *Rasayani*(Vitalises tissues), *Tikta*(Bitter), *Kashaya*(Astringent) in taste, *Ushna*(Hot in potency), *Shukrala*(Increases semen), Cures *Shwasa*(Dyspnoea), *Kasa*(Cough), *Vrina*(Ulcers), *Kandu*(Itching), *Visha*(Poison), *Krimi*(Worms), *Kshata*(Injury), *Shukra Janana*(Promotes semen), *Kantidayaka*(Improves complexion).
- **Nimba**¹¹¹¹- It is *Tikta*(Bitter), *Sheeta Virya*(Cold in potency), *Laghu*(Light), subsides *Kapha* and *Pitta Dosh*s. It alleviate *Rakta Dosh*a (Blood diseases), *Kustha*(Skin diseases), *Kandu*(Itching), *Vrina*(Wounds and Ulcers).
- **Khadira**¹¹²¹- *Khadira* is *Tikta*(Bitter), *Sheeta Virya*(Cold in potency). It alleviate *Pitta, Kapha Rakta Dosh*s, *Kustha*(Skin diseases), *Amadosha, Kasa*(Cough), *Kandu*(Itching), *Krimi*(Worms).
- **Tila**¹¹³¹- *Tila* seeds are *Katu*(Pungent), *Tikta*(Bitter), *Kashaya*(Astringent), in taste, *Katu Vipaka*(Pungent in post digestive effect), *Swadu*(Palatable), *Snigdha*(Demulcent), *Ushna*(Hot in potency), *Kapha-Pitta-Shamaka, Balya*(Tonic), *Keshya*(Hair tonic), *Hima Sparsha*(Cold in touch), *Stanya*(Promotes breast milk), *Vrina Hita*(Heals wound), *Dantya*(Strengthen the teeth), *Apla Mutra Krit*(Reduces quantity of urine), *Grahi*(Absorbent), *Vatagna*(Pacifies *Vata*), *Agniprada*(Increases appetite), Black seeds of *Tila Shukrala*(Increases semen), and considered *Shreshtha*(Best).
- **Kapikacchu**¹¹⁴¹- *Kapikacchu* acts as *Vrishya*(Aphrodisiac), *Vatahara*(Subsides *Vata Dosh*a)
- **Kumari**¹¹⁵¹- The *Kumari* is *Sheetala*(Cold in potency), *Tikta*(Bitter) in taste, *Madagandhi*(Characteristic smell), alleviate *Kapha Dosh*a, *Pitta Vikara, Kasa*(Cough), *Visha*(Poison effects), *Shwasa*(Dyspnoea).
- **Apamarga**¹¹⁶¹- *Apamarga* is *Tikta*(Bitter), *Ushna Virya*(Hot in potency), *Katu*(Pungent), *Sangrahi*(Absorbent), *Vamaka*(Causes vomiting), subsides *Kapha Dosh*a, *Arsha*(Haemorrhoids), *Udararoga*(Diseases of abdomen), *Kandu*(Itching), *Amadosha*(Toxins), *Raktadosha*(Blood disorders).
- **Jiraka**¹¹⁷¹- The *Jeeraka* is *Katu*(Pungent), *Ruksha*(Dry), *Vatahara*(Subsides *Vata Dosh*a), *Parama Agnidipana*(Excellent appetizer). It alleviate *Gulma*(Visceral organ diseases), *Adhmana*(Distention of the abdomen), *Atisara*(Diarrhoea), *Grahani*(Dysentery), *Krimi*(Worms).

- **Jatamansi**^[18]- Roots and rhizomes of *Nardostachys jatamansi* are used to treat hysteria, epilepsy, and convulsions
- **Yava**^[19]- Yava is *Kashaya*(Astringent), *Madhura*(Sweet), *Sheeta*(Cold in potency), *Lekhana*(Scraping or depletes the fatty tissue), *Mrudu*(Soft), *Ruksha*(Drying), *Medha*(Improves Memory), *Agni Vardhana*(Improves appetite), *Katu Paka*(Pungent in post digestive effect), *Swarya*(Good for voice), *Balakara*(Strength promoter), *Guru*(Heavy), *Varnya*(Improves complexion), *Sthairyakara*(Gives stamina and satbility), *Picchila*(Slimy), Cures diseases of throat, skin, *Kapha*, *Pitta* and *Meda*. Alleviates *Peenasa*(Chronic rhinitis), *Shwasa*(Dyspnoea), *Kasa*(Cough), *Urusthambha*(Rigid pelvis), diseases of *Rakta*, and *Trishna*(Thirst).
- **Dhanyaka**^[20]- The wet coriander is *Swadu*(Tasty), *Sugandhi*(Aromatic), *Ruchikar*(Taste promoter), The dried coriander is *Madhura Vipaka*(Sweet at post digestive effect), *Snigdha*(Demulcent). It subside *Trishna*(Excess thirst), *Kasa*(Cough), *Vamana*(Vomiting), *Jwara*(Fever), *Chakshushya*(Good for eyes). It is *Kashaya*(Astringent), *Tikta*(Bitter), *Madhura*(Sweet), *Ruchikara*(Taste promoter), *Dipana*(Appetizer), *Pachana*(Digestive).
- **Kamala**^[21]- The *Rakta Kamala* is *Sheeta Virya*(Cold in potency), *Tikta*(Bitter), *Madhura*(Sweet) in taste. It subside *Pitta* diseases, *Daha*(Burning sensation), blood disorders.
- **Ikshu**^[22]- The *Ikshu* is *Saraka*(Laxative), *Guru*(Heavy), *Snigdha*(Demulcent), *Brimhana*(Nourishing), *Mutrala*(Diuretic), *Shukravardhaka*(Increases semen), *Sheeta Virya*(Cold in potency), *Vatashamaka*(Subsides *Vata Dosha*). Aggravates *Vata Dosha* after immediate consumption of food.
- **Shunthi**^[23]- It is *Ruchya*(Promotes taste), *Amavatagna*(Cure rheumatoid arthritis), *Pachani*(Digestive), *Katuka*(Pungent in taste), *Laghu*(Light), *Snigdha*(Presence of volatile oils), *Ushna*(Heat producing), *Madhura Paka*(Sweet after post digestive effect), alleviates *Kapha-Vata*, *Vibandha*(Constipation). It is *Vrushya* (Aphrodisiac), cures *Swarya*(Improves voice), *Vami*(Vomiting), *Shwasa*(Dyspnoea), *Shoola*(Colic), *Kasa*(Cough), *Hridayamaya*(Heart diseases), *Shleepada*(Filariasis), *Shotha*(Edema), *Arsha*(Haemorrhoids), *Anaha*(Distention of abdomen), *Udara Maruta*(Flatulence). It is *Agni Guna* dominant(Qualities of fire), *Toyamsha Parishosha*(Water absorbent), *Sangrahi*(Hardens the stool).

Aims and objectives

- To determine the specific gravity and bulk density of the above mentioned drugs.
- To assessment and understanding the relation between *Parthivatwa* on the basis of parametric test of specific gravity and bulk density of given drugs, their properties like void space or void ratio, degree of saturation etc.

2. Materials and methods

- Pyncometer bottle of 50 ml with stopper having capillary hole
- Balance to weigh the materials (accuracy 1gm)
- Tap density apparatus
- Wash bottle with distilled water
- Alcohol and ether
- Measuring cylinder
- Spatula
- Petri dish
- Filter paper
- Funnel
- Conical flask
- Beaker

2.1. Need for the study

- The knowledge of specific gravity is needed in calculation of Guru and Laghu drugs and Density tests are for properties like void ratio, degree of saturation etc.

3. Results

Table 1 Specific Gravity of Solids

Sl.no	Tests	Drug name	Results/observations
1.	Specific Gravity (Solids)	<i>Asthishrunkhala</i> (<i>Cissus quadrangularis</i> Linn)	1.34
2.	Specific Gravity (Solids)	<i>Sariva</i> (<i>Hemidesmus indicus</i> R.Br)	1.08
3.	Specific Gravity (Solids)	<i>Vidari</i> (<i>Pueraria tuberosa</i> DC)	1.21
4.	Specific Gravity (Solids)	<i>Maricha</i> (<i>Piper nigrum</i> Linn)	1.04
5.	Specific Gravity (Solids)	<i>Shatavari</i> (<i>Asparagus racemosus</i> Willd)	0.37
6.	Specific Gravity (Solids)	<i>Jambu</i> (<i>Syzygium cumini</i> Linn)	1.53
7.	Specific Gravity (Solids)	<i>Godhuma</i> (<i>Triticum aestivum</i> Linn)	2.12
8.	Specific Gravity (Solids)	<i>Usheera</i> (<i>Vetiveria zizanioidis</i> Linn)	1.12
9.	Specific Gravity (Solids)	<i>Ashwagandha</i> (<i>Withania somnifera</i> Linn)	1.38
10.	Specific Gravity (Solids)	<i>Nimba</i> (<i>Azadirachta indica</i> A. Juss)	1.65
11.	Specific Gravity (Solids)	<i>Khadira</i> (<i>Acacia catechu</i> Willd)	1.63
12.	Specific Gravity (Solids)	<i>Tila</i> (<i>Sesamum indicum</i> Linn)	8.09
13.	Specific Gravity (Solids)	<i>Kapikacchu</i> (<i>Mucuna pririta</i> Hook)	1.68
14.	Specific Gravity (Solids)	<i>Bala</i> (<i>Sida cordifolia</i> Linn)	1.21
15.	Specific Gravity (Solids)	<i>Yava</i> (<i>Hrdeum vulgare</i> Linn)	2.38
16.	Specific Gravity (Solids)	<i>Dhanyaka</i> (<i>Coriandrum sativum</i> Linn)	2.64

Table 2 Specific Gravity of Liquids

Sl.no.	Tests	Drug name	Results/observations
1.	Specific gravity (Liquids)	<i>Kumari</i> (<i>Aloe vera</i> Tourn.ex Linn)	9.09
2.	Specific gravity (Liquids)	<i>Vidari</i> (<i>Pueraria tuberosa</i> DC)	1.38
3.	Specific gravity (Liquids)	<i>Sariva</i> (<i>Hemidesmus indicus</i> R.Br)	1.08
4.	Specific gravity (Liquids)	<i>Shunthi</i> (<i>Zingiber officinale</i> Roxb)	1.40
5.	Specific gravity (Liquids)	<i>Ikshu</i> (<i>Saccharum officinarum</i> Linn)	1.40
6.	Specific gravity (Liquids)	<i>Usheera</i> (<i>Vetiveria zizanioidis</i> Linn)	1.1
7.	Specific gravity (Liquids)	<i>Kamala</i> (<i>Nelumbo nucifera</i> Gaertn)	0.82
8.	Specific Gravity (Liquids)	<i>Apamarga</i> (<i>Achyranthus aspera</i> Linn)	0.68
9.	Specific gravity (Liquids)	<i>Shatavari</i> (<i>Asparagus racemosus</i> Willd)	1.82
10.	Specific gravity (Liquids)	<i>Bala</i> (<i>Sida cordifolia</i> Linn)	1.28
11.	Specific gravity (Liquids)	<i>Yava</i> (<i>Hrdeum vulgare</i> Linn)	1.98
12.	Specific gravity (Liquids)	<i>Dhanyaka</i> (<i>Coriandrum sativum</i> Linn)	1.62

Table 3 Density Tests(Bulk)

Sl.no.	Tests	Drug name	Results/observations
1.	Bulk Density	<i>Ashthishrunkhala(Cissus quadrangularias Linn)</i>	0.59 gms/ml
2.	Bulk Density	<i>Sariva(Hemidesmus indicus R.Br)</i>	0.32 gms/ml
3.	Bulk Density	<i>Vidari(Pueraria tuberosa DC)</i>	0.5 gms/ml
4.	Bulk Density	<i>Maricha (Piper nigrum Linn)</i>	0.54 gms/ml
5.	Bulk Density	<i>Shatavari(Asparagus racemosus Willd)</i>	0.33 gms/ml
6.	Bulk Density	<i>Bala(Sida cordifolia Linn)</i>	0.28 gms/ml
7.	Bulk Density	<i>Jambu(Syzygium cumini Linn)</i>	0.5 gms/ml
8.	Bulk Density	<i>Godhuma(Triticum aestivum Linn)</i>	0.47 gms/ml
9.	Bulk Density	<i>Usheera(Vetiveria zizanioidis Linn)</i>	0.16 gms/ml
10.	Bulk Density	<i>Ashwagandha(Withania somnifera Linn)</i>	0.40 gms/ml
11.	Bulk Density	<i>Nimba(Azadirachta indica A. Juss)</i>	0.33 gms/ml
12.	Bulk Density	<i>Khadira(Acacia catechu Willd)</i>	0.41 gms/ml
13.	Bulk Density	<i>Tila(Sesamum indicum Linn)</i>	0.35 gms/ml
14.	Bulk Density	<i>Kapikacchu(Mucuna pririta Hook)</i>	0.40 gms/ml
15.	Bulk Density	<i>Kumari(Aloe vera Tourn.ex Linn)</i>	0.38 gms/ml
16.	Bulk Density	<i>Apamarga(Achyranthus aspera Linn)</i>	0.36 gms/ml
17.	Bulk Density	<i>Jiraka(Cuminum cyminum Linn)</i>	0.31 gms/ml
18.	Bulk Density	<i>Jatamansi(Nardostachys jatamansi DC)</i>	0.31 gms/ml
19.	Bulk Density	<i>Yava(Hrdeum vulgare Linn)</i>	0.48 gms/ml
20.	Bulk Density	<i>Dhanyaka(Coriandrum sativum Linn)</i>	0.33 gms/ml

Table 4 True Density

Sl.no.	Tests	Drugs	Results/observations
1.	True Density	<i>Ashthishrunkhala(Cissus quadrangularias Linn)</i>	0.78 gms/ml
2.	True Density	<i>Sariva(Hemidesmus indicus R.Br)</i>	0.47 gms/ml
3.	True Density	<i>Vidari(Pueraria tuberosa DC)</i>	0.71 gms/ml
4.	True Density	<i>Maricha (Piper nigrum Linn)</i>	0.73 gms/ml
5.	True Density	<i>Shatavari(Asparagus racemosus Willd)</i>	0.58 gms/ml
6.	True Density	<i>Bala(Sida cordifolia Linn)</i>	0.65 gms/ml
7.	True Density	<i>Jambu(Syzygium cumini Linn)</i>	0.75 gms/ml
8.	True Density	<i>Godhuma(Triticum aestivum Linn)</i>	0.71 gms/ml
9.	True Density	<i>Usheera(Vetiveria zizanioidis Linn)</i>	0.26 gms/ml
10.	True Density	<i>Ashwagandha(Withania somnifera Linn)</i>	0.69 gms/ml
11.	True Density	<i>Nimba(Azadirachta indica A. Juss)</i>	0.59 gms/ml
12.	True Density	<i>Khadira(Acacia catechu Willd)</i>	0.69 gms/ml

13.	True Density	<i>Tila(Sesamum indicum Linn)</i>	0.35 gms/ml
14.	True Density	<i>Kapikacchu(Mucuna pririta Hook)</i>	0.64 gms/ml
15.	True Density	<i>Kumari(Aloe vera Tourn.ex Linn)</i>	0.78 gms/ml
16.	True Density	<i>Apamarga(Achyranthus aspera Linn)</i>	0.56 gms/ml
17.	True Density	<i>Jiraka(Cuminum cyminum Linn)</i>	0.52 gms/ml
18.	True Density	<i>Jatamansi(Nardostachys jatamansi DC)</i>	0.55 gms/ml
19.	True Density	<i>Yava(Hrdeum vulgare Linn)</i>	0.54 gms/ml
20.	True Density	<i>Dhanyaka(Coriandrum sativum Linn)</i>	0.52 gms/ml

4. Discussion

The drugs have been selected for experimentation are; *Asthishrankhala, Sariva, Vidari, Maricha, Shatavari, Bala, Jambu, Godhuma, Ushira, Ashwagandha, Nimba, Khadira, Tila, Kapikacchu, Kumari, Apamarga, Jiraka, Jatamansi, Yava, Dhanyaka, Kamala Ikshu, Shunthi.*

- **Specific Gravity of Solids-**The experiments were carried out by following steps; Clean and dry the density bottle. Wash the bottle with water and allow it to drain. Again wash it with alcohol and drain it to remove water. Then wash it with ether, to remove alcohol and drain ether. Weigh the empty bottle with stopper . This is known as (W_1). Take about 1gm of oven powder sample which is cooled in a desiccator. Transfer it to the bottle. Find the weight of the bottle and sample. The obtained weight is known as (W_2). Add 10 ml of distilled water in the bottle to allow the sample to soak completely. Leave it for about 2 hours. Again fill the bottle completely with distilled water put the stopper and keep the bottle under constant temperature water bath. Take the bottle outside and wipe it clean and dry. Now determine the weight of the bottle and the contents. Then the obtained weight was known as (W_3). Now empty the bottle and thoroughly clean it. Fill the bottle with only distilled water and weigh it. Let it be at temperature. The obtained weight was known as (W_4). Repeat the same process for 2 to 3 times, to take the average reading of it.
- **Specific Gravity of Liquids-** Weigh the empty Pycnometer with stoppered on the analytical weighing balance ie W_1 . Fill the exact volume of sample solution into the Pycnometer carefully. It should come nearly to the rim of the Pycnometer. Insert the stopper and tapping the sides gently to remove the air bubble. Firmly and evenly seat the stopper on the Pycnometer flask. A small amount of liquid should appear from the hole in the stopper. Dry the sides and weigh the filled Pycnometer with stoppered again on the analytical weighing balance ie W_2 . Note down the temperature of the sample. Calculate the sample weight by using formula.

Sample weight(G)= (Weight of filled Pycnometer with stopper)-(Weight of empty Pycnometer with stopper)

Calculate the specific gravity of the liquid sample by using formula.

Specific gravity of the sample = Density of the substance / Density of the purified water(g/cm^3)

Specific gravity of the sample= Weight of the substance / Weight of an equal volume of water(g/cm^3)

- **The Bulk Density-** It is calculated by mass per volume. Weigh the sample and carefully transfer in to the measuring cylinder and measure the volume.
- **The True Density-** It is calculated by mass per volume. The obtained results were calculated as per equation stated below.

4.1. Calculation

- **Specific gravity of the sample =** Density of water at 27 °C / Weight of water of equal volume

$$=(W_2-W_1) / (W_4-W_1) - (W_3-W_2) \text{ OR}$$

$$=(W_2-W_1) / (W_2-W_1) - (W_3-W_4)$$

- **Bulk Density**= Mass / Volume gms/ml
Where as Mass is sample drug and Volume is the measurement of filled sample in the cylinder.
- **True Density** = Mass / Tapped volume
Where as Mass is sample drug and Volume is the measurement of filled sample in the cylinder after continuous tapping till the constant reading observed .

5. Conclusion

Unless or otherwise specified specific gravity values reported shall be based on water at 27 °C . The specific gravity of the soil particles lie with in the range of 2.65 to 2.85. Soils containing organic matter and porous particles may have specific gravity values below 2.0. Soils having heavy substances may have values above 3.0. These tests determine the purity of the drugs. Hence the impurities tend to have different densities resulting in deviation from the expected specific gravity. The quality control in various industries to insure consistent product characteristics and identify unknown drugs by comparing their densities with known drugs. The present work is dealt with assessment and understanding the relation between *Parthivatwa*(Solidity) and *Jaliyatwa*(Liquidity) on the basis of parametric tests like specific gravity and bulk density and the knowledge of these tests are needed in calculation of the drugs along with their properties like void ratio, degree of saturation etc.

Compliance with ethical standards

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