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# STUDIES ON SURFACE TENSION OF SELECTED ANTHELMINTIC FORMULATIONS BY DROP NUMBER METHOD USING TRAUBE'S STALAGNOMETER TECHNIQUE

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***ABSTRACT:***

*The three selected marketed anthelmintic formulations were carried out using Traube's stalagmometer technique by drop number method to determine their individual surface tension for further identification, structure elucidation and chemical constituents. The formulation I (Mebendazole I.P), formulation II (Albendazole I.P), formulation III (Invermectin B.P and Albendazole I.P) were selected for the case study. These formulations were also evaluated to their same quantity mixture ratio with distilled water combination for estimation of different percent composition. The main aim and rationale of the study was to evaluate the surface tension of three selected formulations with distilled water. The 10% formulation mixture with distilled water showed maximum surface tension (65.72 dyne/cm) and 60% formulation mixture with distilled water showed minimum surface tension (49.59 dyne/cm) amongst other compositions. In individual surface tension study, it was noted that formulation II showed maximum surface tension (70.90 dyne/cm) and formulation I showed minimum surface tension (40.79 dyne/cm) amongst the other formulations under laboratory conditions.*

***Keywords:*** *Surface tension, Anthelmintics, Drop number method, Traube's stalagmometer.*

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**INTRODUCTION:**

Anthelmintics are the drugs that are used to treat infections with parasitic worms. This includes both flat worms and round worms. Anthelmintics or antihelminthics are the drugs that expelled parasitic worms from the body by stunning or killing them. They may also be called vermifuges (stunning) or vermicides (killing).[1-3] Surface tension is the force per unit length that must be applied parallel to the surface so as to counter balance the net inward pull. Surface tension has the units if dyne/cm in the CGS system and Newton/m in the SI system. Traube's stalagmometer is an instrument for measuring surface tension by determining the exact number for drops in a given quantity of a liquid. The drop number method is based on the principle that a fixed volume of a liquid is delivered is free falling from a capillary tube held vertically approximately proportional to the surface tension of liquid. Surface tension is the result of the difference between attractions of molecule of the substance on the other side of the interface. The surface tension of water is created by Vander wall forces. (an electric force between the molecules in order to increase the surface tension). One would have to find a way increasing the range of force or strength of these electric forces [4-7]. The formulation I (Mebendazole I.P), formulation II ((Albendazole I.P), formulation III (Invermectin B.P and Albendazole I.P) were selected for case studies. The significance of the study was to determine individual surface tension for each marketed formulations and also evaluated to their quantity mixture ratio with distilled water combination for estimation of various percent composition.

**MATERIALS AND METHOD [8-12]:**

Three formulations were purchased from local market. Nitric acid and acetone were purchased from loba chemie (Mumbai). All the chemicals used were of analytical grade.

**Experimental Methodology:**

Step I. The specific gravity bottle is cleaned thoroughly with nitric acid, rinsed the bottle with distilled water and dried it rinsing with acetone. Accurately weigh the specific gravity bottle and data was noted. Bottle was filled with water and weight was noted. Then bottle was cleaned and dried. The bottle is again filled with formulation I, II, III and weight was noted respectively. The specific gravity of three formulation was estimated using following:

$$\text{Specific Gravity} = \frac{\text{Mass of liquid}}{\text{Mass of equal volume of distilled water}}$$

Step II. Traube's stalagmometer was cleaned and dried and mounted in the vertical plane by using burette stand. The number of drops falling down between two points of instrument was counted serially for all the liquids i.e. distilled water, formulation I, II, III. The process was repeated three times and means value was calculated.

Step III. The surface tension of three selected formulation was estimated from the following.

Step IV. The marketed formulation mixture were prepared at the ratio of 1:1:1 and different compositions of formulation quantity mixture with distilled water such as 10-90, 20-80, 30-

70, 40-60, 50-50, 60-40, 70-30, 80-20, 90-10 were prepared. The mixtures were weighed accurately and their specific gravity were calculated

Step V. Each formulation was taken into traube's stalagmometer and the no. of drops counted and their surface tension was calculated using the same formula.

$$\text{surface tension of liquid} = \text{specific gravity of liquid} \times \frac{\eta_1}{\eta_2} \times \text{Surface tension of water}$$

## RESULTS AND DISCUSSION:

**Table: 1 Specific gravity and surface tension of individual formulation**

**Temp: Room temperature**

| S.No. | Standard / formulations | Number of drops | | | Mean no. of drops | Specific gravity | Surface Tension (dyne/cm) |
|---|---|---|---|---|---|---|---|
| | | I | II | III | | | |
| 1. | Standard: Distilled water | 75 | 73 | 74 | 74 | 1 | 72.80 |
| 2. | Formulation I | 160 | 155 | 159 | 159 | 1.204 | 40.79 |
| 3. | Formulation II | 90 | 92 | 97 | 93 | 1.224 | 70.90 |
| 4. | Formulation III | 108 | 105 | 108 | 107 | 1.176 | 59.21 |

**Table 2: Surface tension of different composition of formulation quantity mixture with distilled water**

**Temperature = Room Temperature (approx 25 $^0$C)**

| S.No. | Composition of formulation mix (1:1:1) with distilled water (%) | Number of drops | | | Mean no. of drops | Specific gravity | Surface Tension (dyne/cm) |
|---|---|---|---|---|---|---|---|
| | | I | II | III | | | |
| 1. | Standard : Distilled water | 75 | 73 | 74 | 74 | 1 approx | 72.80 |
| 2. | 10% | 83 | 85 | 84 | 84 | 1.026 | 65.72 |
| 3. | 20% | 103 | 110 | 108 | 107 | 1.045 | 52.56 |
| 4. | 30% | 110 | 107 | 110 | 109 | 1.060 | 52.31 |
| 5. | 40% | 112 | 111 | 113 | 112 | 1.078 | 51.79 |
| 6. | 50% | 115 | 114 | 116 | 115 | 1.098 | 51.39 |
| 7. | 60% | 124 | 119 | 120 | 121 | 1.115 | 49.59 |
| 8. | 70% | 116 | 118 | 117 | 117 | 1.134 | 52.17 |
| 9. | 80% | 108 | 110 | 112 | 110 | 1.149 | 56.21 |
| 10. | 90% | 112 | 116 | 114 | 114 | 1.166 | 55.09 |

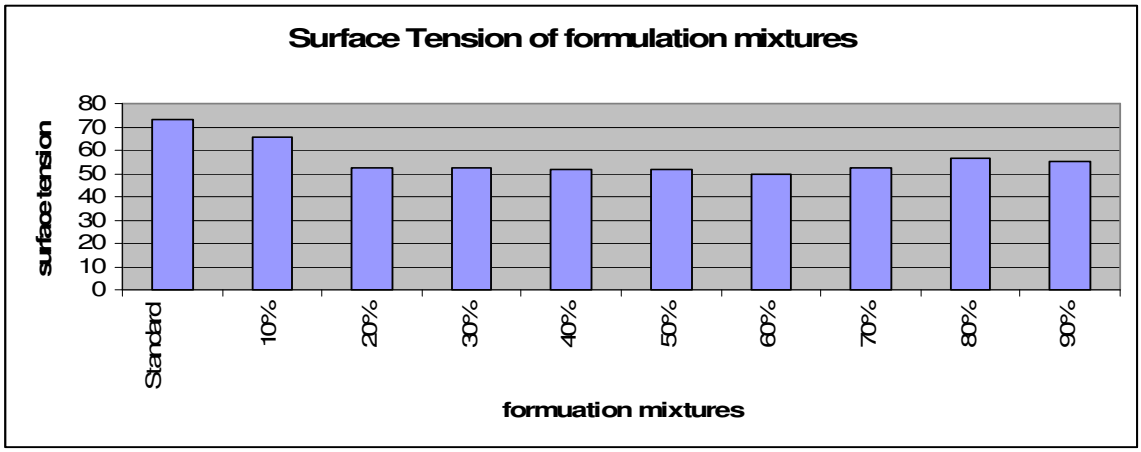


Fig 1. Comparative surface tension of different formulation mixture

**CONCLUSION:**

From table no. 1, it was found that the formulation I (40.79 dyne/cm) showed lowest value and the formulation II (70.90 dyne/cm) showed highest value amongst the other formulations in individual surface tension studies under laboratory conditions (at 20$^{o}$C approx). The three formulations surface tension values showed lower values than the standard.

From table no. 2, it was found that the 60% formulation mixture with distilled water (49.59 dyne/cm) showed minimum surface tension and the 10% formulation mixture (1:1:1) with distilled water (65.72 dyne/cm) showed maximum surface tension amongst the other compositions. The 20%, (52.56 dyne/cm), 30% (52.31 dyne/cm) and 70% (52.17 dyne/cm) formulation mixtures (1:1:1) with distilled water showed approximately same values as well as 40% (51.79 dyne/cm) and 50% (51.39 dyne/cm) formulations mixtures (1:1:1) with distilled water showed approximately same values.

The results indicated that the difference between attraction molecule of the substance have for each other and their attraction for the molecule of the substance of the other side of the interface.

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