

EFFECT OF CERTAIN ORGANIC AND INORGANIC
ADDITIVES ON THE FLOCCULATION SUSPENSION CONT-
AINING DIFFERENT SULPHONAMIDES

F.S. Habib, A.E. Aboutaleb, M.A. Attia
Department of Pharmaceutics, Faculty of Pharmacy, Univer-
sity of Assiut, Assiut, Egypt.

The effect of various concentrations of certain organic and inorganic additives on the flocculation of suspensions containing three sulphonamides were investigated. It was found that the sedimentation volume increased relatively in the case of suspensions containing sulphadimidine, then sulphaguanidine which in turn was more than sulphanilamide. It was concluded that the nature of the additives and their concentrations as well as their effects in the cloud point of the surfactant used greatly affected the sedimentation volume. Other factors such as the difference in particle size and density among the three drugs used may also play a part.

Non-ionic surfactants are employed in pharmaceutical and cosmetic disperse systems as wetting agents, emulsifiers and stabilizers. Interfacial properties of these surfactants, are significantly influenced by their state of dissolution¹. Certain alcohols caused an increase in the hydration of polyoxyethylene nonylphenol ethers, while others led to the opposite effects².

An important factor in the shelf-life stability of pharmaceutical suspensions in the state of flocculation of the particles. Deflocculated suspensions tend to cake. Flocculated systems, on the other hand, are generally much easier to redisperse and are preferred for this reason^{3,4,5}

The purpose of this work is to investigate the effect of various organic and inorganic additives on the stability of suspensions containing different sulphonamides. It is likely that additives that affect the hydration state of the surfactants may also alter the degree of flocculation of the suspension containing different sulphonamides.

EXPERIMENTAL

Materials:

Polyoxyethylene sorbitan mono-laurate^(a), sulphanilamide, sulphaguanidine, and sulphadimidine^(b), sodium sulphate, propylene glycol, polypropylene glycol, glycole, polyethylene glycole 3000 and 400^(c)

Preparation of the suspension:

Twenty ml of 2% aqueous solution of polysorbate 40 was added to 10 gm of each sulphadimidine, sulphanilamide and sulphaguanidine in a mortar. After dispersion, the additive was added as an aqueous solution. After thorough agitation, the suspension was transferred to measuring cylinder. The mortar was rinsed with water and the cylinder was made up to 100 ml with water. The suspension was agitated in the cylinder for about 0.5 min. and then permitted to sediment. Sulphadimidine, sulphanilamide and sulphagaundine suspensions were permitted to stand until the volume of sediment did not change for at least two weeks. The flocculation state of the suspensions was assessed using the sedimentation volume.

a) Atlas chemical Industries, Delaware, U.S.A.

b) Elnasr chemical company, Egypt.

c) British drug house, poole, England.

RESULTS AND DISCUSSION

Figure (1) shows the effect of propylene glycol concentration on the sedimentation volume of the three sulphadimidine drugs. It was found that on using 40% propylene glycol or less, the sedimentation volume of sulphadimidine ranged from 0.20 to 0.22. These suspensions were flocculated and became capable of redispersion by inversion and shaking of the mixing cylinders. At 30% propylene glycol concentration or less the sedimentation volume of sulphanilamide ranged from 0.24 to 0.27. These suspensions were also flocculated and capable of redispersion by inversion and shaking of the mixing cylinders. But, in the case of sulphaguandine it was found that on using 40% propylene glycol concentration, the sedimentation volume of the drug ranged from 0.25 to 0.26. These suspensions were deflocculated and became impossible to redisperse after standing for about two weeks. The sedimentation volume of sulphanilamide suspensions was decreased by using propylene glycol at concentration of 30% or higher. But, in the case of sulphadimidine and sulphaguanidine suspensions with propylene glycol concentration of 40% or higher, the sedimentation volume of these drugs was decreased.

Figure (2) shows the effect of sodium sulphate concentrations on the sedimentation volume of sulphanilamide, sulphadimidine and sulphaguanidine suspensions containing 2% polysorbate 40. It was found that in the case of sulphanilamide suspension, deflocculation occur on using 2% sodium sulphate concentration; above 2% w/v sodium sulphate the suspension became flocculated. This was also the case for sulphaguanidine. In the case of sulphadimidine the suspension became deflocculated at all the concentrations of sodium sulphate used. This result obtained agreed with

previously published results⁶, which stated that when the sedimentation volume increased there will be a tendency for the suspension to be flocculated.

It is of interest to notice that propylene glycol when used at concentration of 30% and above, caused reduction in the cloud point of the surfactant below 100°C. This was also the case with sodium sulphate. This decrease in the cloud point may be due to dehydration of the polyoxyethylene group of the surfactant molecule. It seems likely that dehydration is involved in the effect of these additives on the properties of the prepared suspensions⁷.

Figure (3) shows the effect of different concentrations of organic additives on the sedimentation volume of dispersions containing sulphonamides stabilized by non-ionic surfactant. It was found that the sedimentation volume increased relatively more in the case of suspensions containing sulphadimidine than sulphaguandine which in turn was more than sulphanilamide. It was found also that, the concentrations of the various organic additives affected the sedimentation volume. Generally, it was found that once the concentration of the organic additives increased from 10 to 30% v/v the sedimentation volume increased much more. The nature of the organic additives used, also affected the sedimentation volume for

the three sulphonamides investigated. It was obvious that, polypropylene glycol has the greatest effect followed by P.E.G. 300, then P.E.G. 400 and lastly glycerol at the various concentrations used. This may be due to the difference in the viscosity of the prepared solutions containing the various additives. Therefore solutions of polypropylene glycol were expected to be more viscous than P.E.C. 300 or 400, as well as glycerol variation in the chemical structure among the different additives used, as well as their effect on the cloud point of the surfactant may play a part. The difference in particle size and density of these sulphonamides will also affect sedimentation volume.

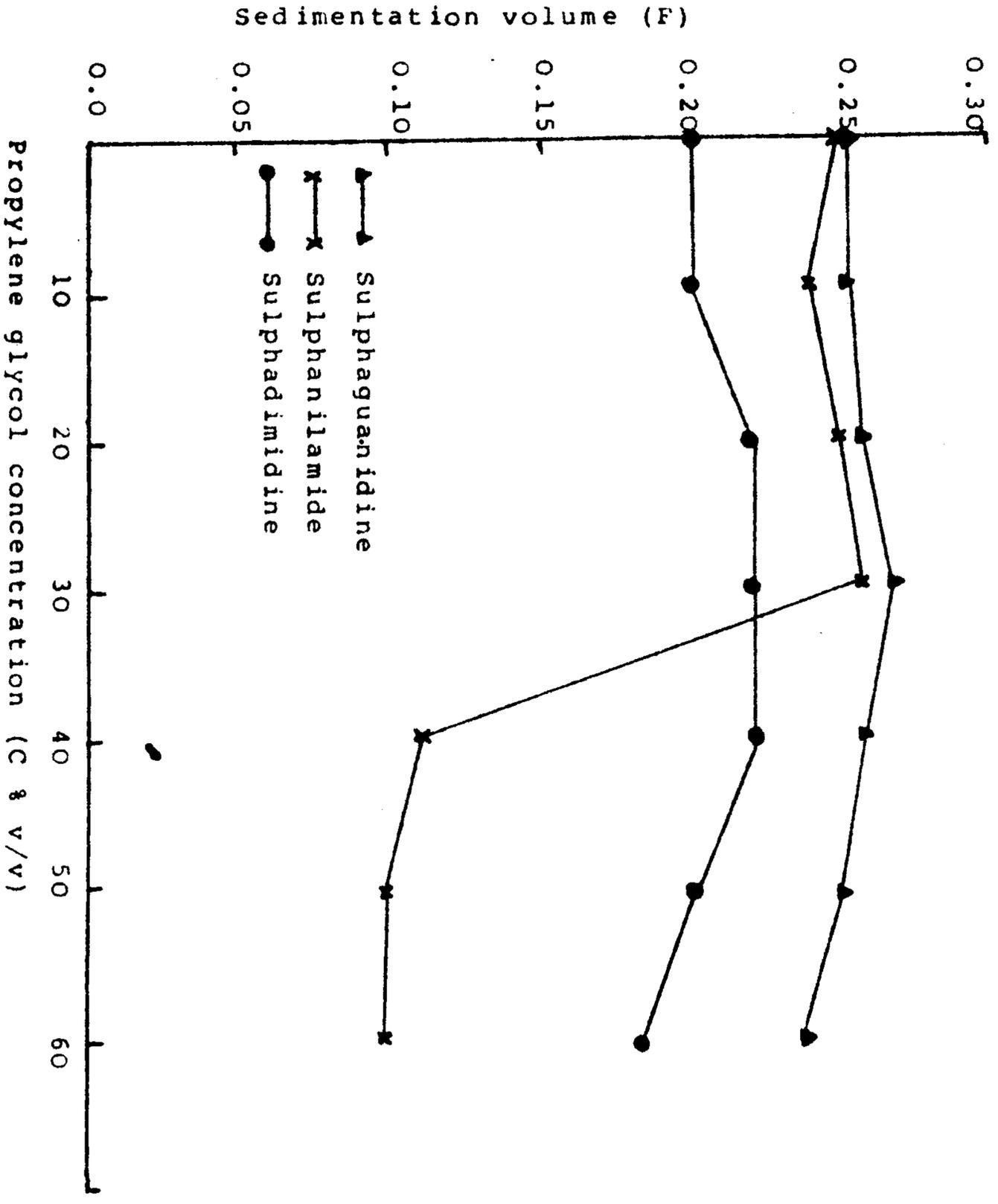


Fig. 1: Effect of propylene glycol concentration (8 v/v) on the sedimentation volume of sulphanilamide, sulphadimidine and sulphaguanidine suspensions containing polysorbate 40.

Effect of certain organic and inorganic additives on the flocculation suspension containing different sulphonamides

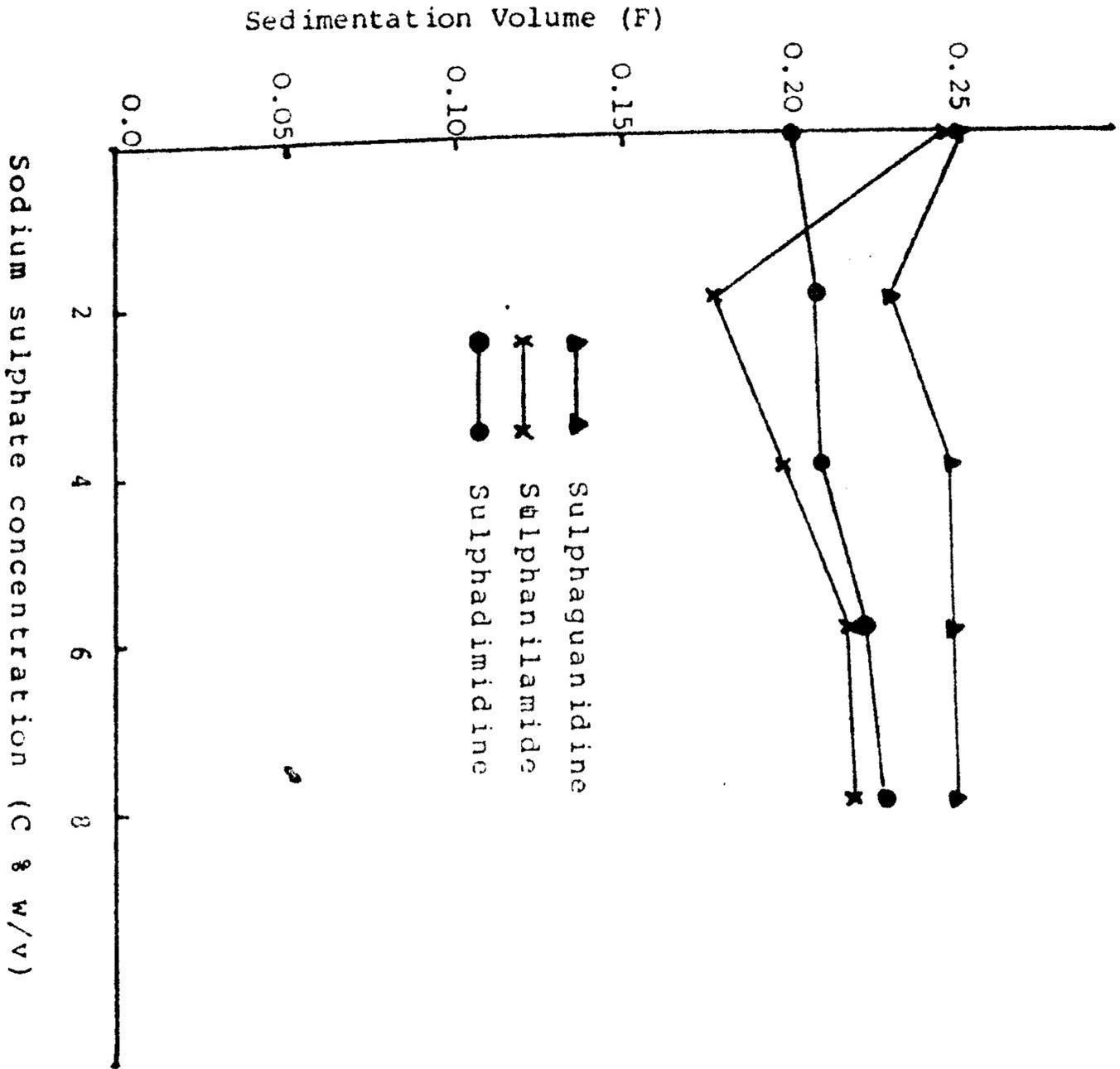


Fig. 2: Effect of sodium sulphate concentrations (% w/v) on the sedimentation volume of sulphanilamide, sulphadimidine and sulphaguanidine suspensions containing polysorbate 40.

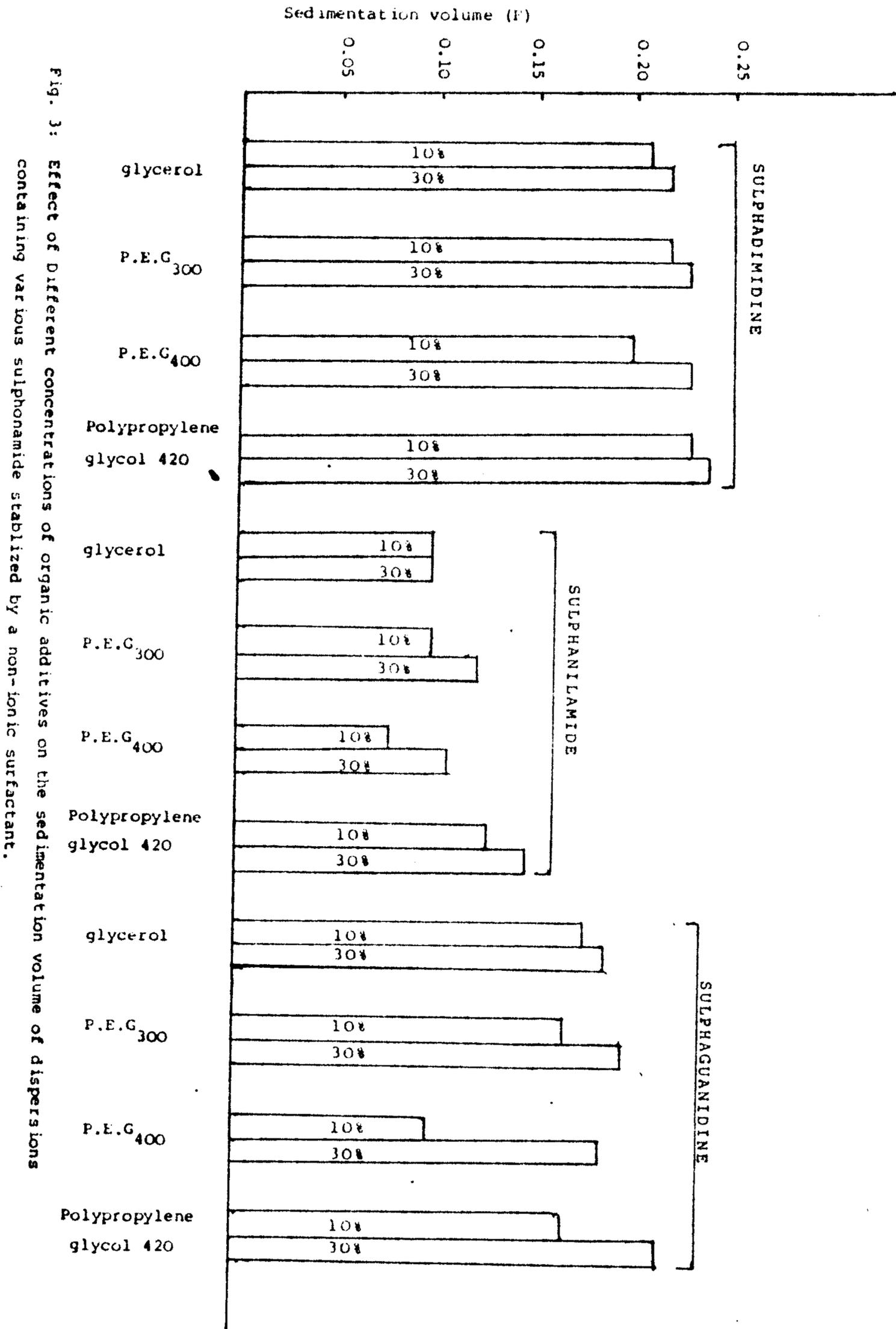


Fig. 3: Effect of Different concentrations of organic additives on the sedimentation volume of dispersions containing various sulphonamide stabilized by a non-ionic surfactant.

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تأثير بعض المضيفات العضوية والغيرعضوية على
تجمع المعلقات التي تحتوى على سلفوناميد مختلفه

فوزية سيد أحمد حبيب ، أحمد السيد أبو طالب ، محمد على عطيه
قسم الصيدلانيات - كلية الصيدلة - جامعة أسسوط.

تم دراسة تأثير تركيزات مختلفة من المضيفات العضوية والغير عضوية على
تجمع معلقات محتوية على ثلاث أنواع من السلفاناميد. وجد أن حجم الترسيب زاد
نسبيا في حالة المعلقات المحتوية على سلفاديميدين تم يليها سلفاجوانيديين والتس
بدورها كانت أكثر من السلفانيلاميد وقد استنتج أن طبيعة هذه الاضافات وتركيزها
الى جانب تأثيرها على نقطة تغيث المنشط السطحي المستعمل أثرت بدرجة كبيرة
على حجم الترسيب.

عوامل أخرى مثل اختلاف حجم الجرثيمات واختلاف الكشافة بين الادوية الثلاثة
المستعملة في هذه الدراسة ربما تلعب دورا في هذا.