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## Background

Cucumber seeds are the seeds of Cucumber (*Cucumis sativus* L.), which include a large number of essential fatty acids, plant sterols, sugar and glycosides, volatile oils, as well as Ca, Mg, and other inorganic elements. The cucumber seed oil has a good UV absorption effect because it is rich in an unsaturated functional group structure. Plant sterol in cucumber seed oil has strong permeability to the skin, which can maintain skin surface moisture, promote skin metabolism and inhibit skin inflammation.  $\beta$ -sitosterol, sitosterol, and vegetable sterol in plant sterols can also effectively protect the peroxide of low-density lipoprotein, so they have an antioxidant effect. Cucumber seed oil has the potential to be developed into a plant sunscreen.

## Objective

This study was designed to explore the best prescription groups and their quality evaluations for sunscreens with cucumber seed oil.

## Methodology

**Soxhlet extraction method to extract cucumber seed oil:** Weigh 56g of cucumber seeds, weigh 7g of aluminum hydroxide, pulverize 3 times with a universal pulverizer, pass through a 60-mesh sieve, remove the unsieved part, measure 150mL of n-hexane as the extraction solvent, The extraction time was 8h, the extraction temperature was 68.5°C, wrapped with filter paper and placed in the extractor, connected to the condenser tube and the round-bottomed flask, heated to make the solvent continuously reflux for extraction; then add an appropriate amount of anhydrous sodium sulfate for dehydration. Until there is just precipitation; the solvent is distilled off at atmospheric pressure to obtain the crude oil of cucumber seeds.

**Preparation of prescriptions:** In this study, n-hexane was used as extraction solvent, cucumber seed oil was extracted by Soxhlet extraction method as plant sunscreen, in which cucumber seed oil was used as the main component, an appropriate amount of titanium dioxide was used as an antioxidant, cucumber seed oil sunscreen was prepared. Taking the settling solvent ratio as the index, the orthogonal experiment was designed to determine the prescription composition of the pure matrix. Then the single factor experiments of cucumber seed oil, titanium dioxide and vitamin E were carried out. The effects of three components on UV absorption were investigated by orthogonal experiments, and the optimum formula with cucumber seed oil as the main component was finally determined and verified.

## References

[1] TIAN Gui-li, et al. "Chemical Components and Efficiency of Cucumber Seeds." *China Vegetables*. 08(2014):7-11.

[2] BEN Hao-xi, et al. "Studies on the Chemical Constituents of Cucumber." *Natural Product Research and Development*. 03(2008):388-394.

## Results

Table 1 Sunscreen prescriptions

component	effect	percentage composition (%)
Octadecanol	Wetting agent	5.0
Span80	Emulsifier	6.0
Octadecanoic acid	Oil raw materials	9.0
Propanetriol	Humectant	10.0
Ethyl p-hydroxybenzoate	Antiseptic	0.4
Tween80	Moisture agent, Emulsifier	3.0
Triethanolamine	Thickener	0.3
Essence	Adjust the fragrance	appropriate amount
Titanium dioxide	Physical sunscreen	0.4
Cucumber seed oil	Main ingredients (sun protection)	2.0
Water	Distilled water (solvent)	52.9
liquid paraffin	Wetting agent	2.0
Vitamin E	Antioxidant	9.0

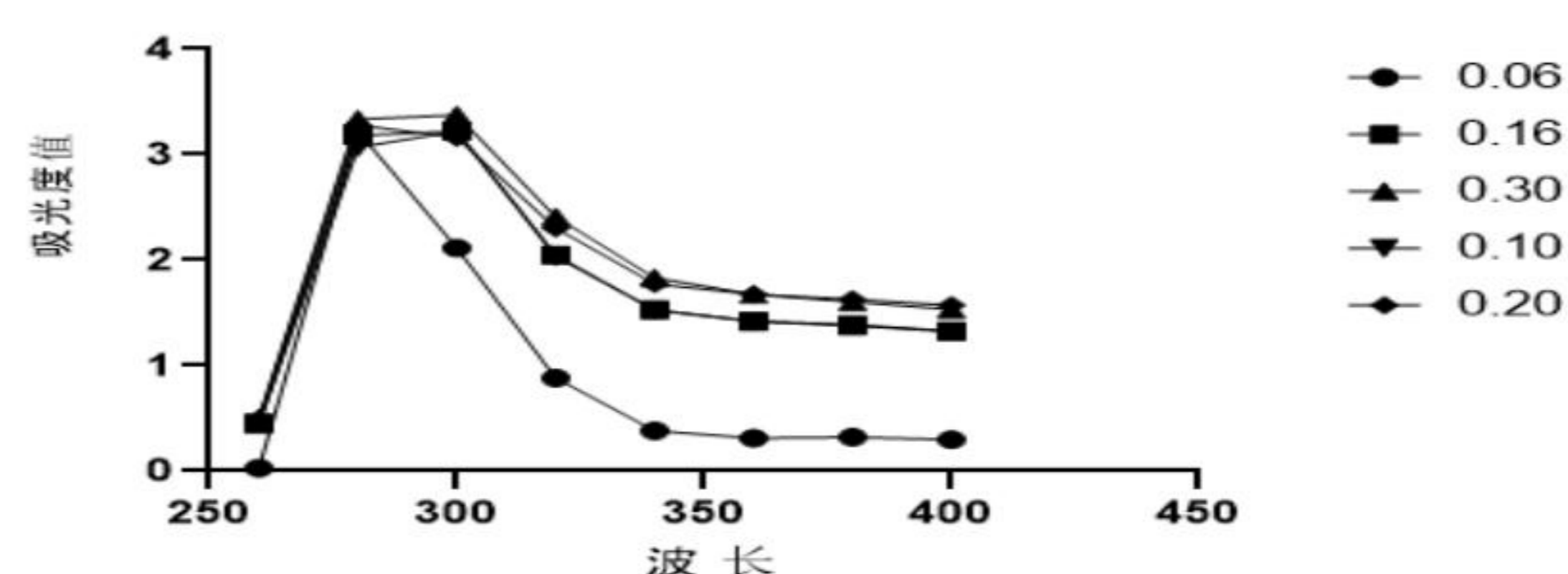


Fig.1 UV absorption at different wavelengths with different contents of TiO<sub>2</sub>

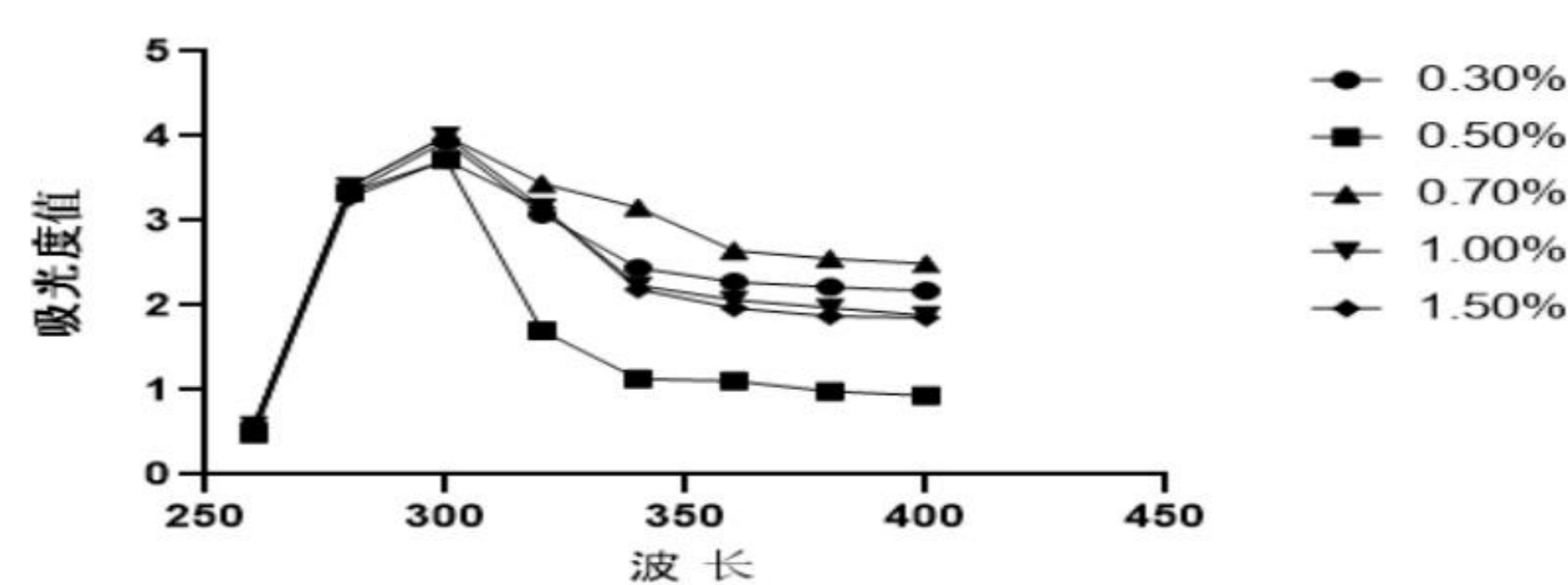


Fig. 2 UV absorption at different wavelengths with different contents of VitE

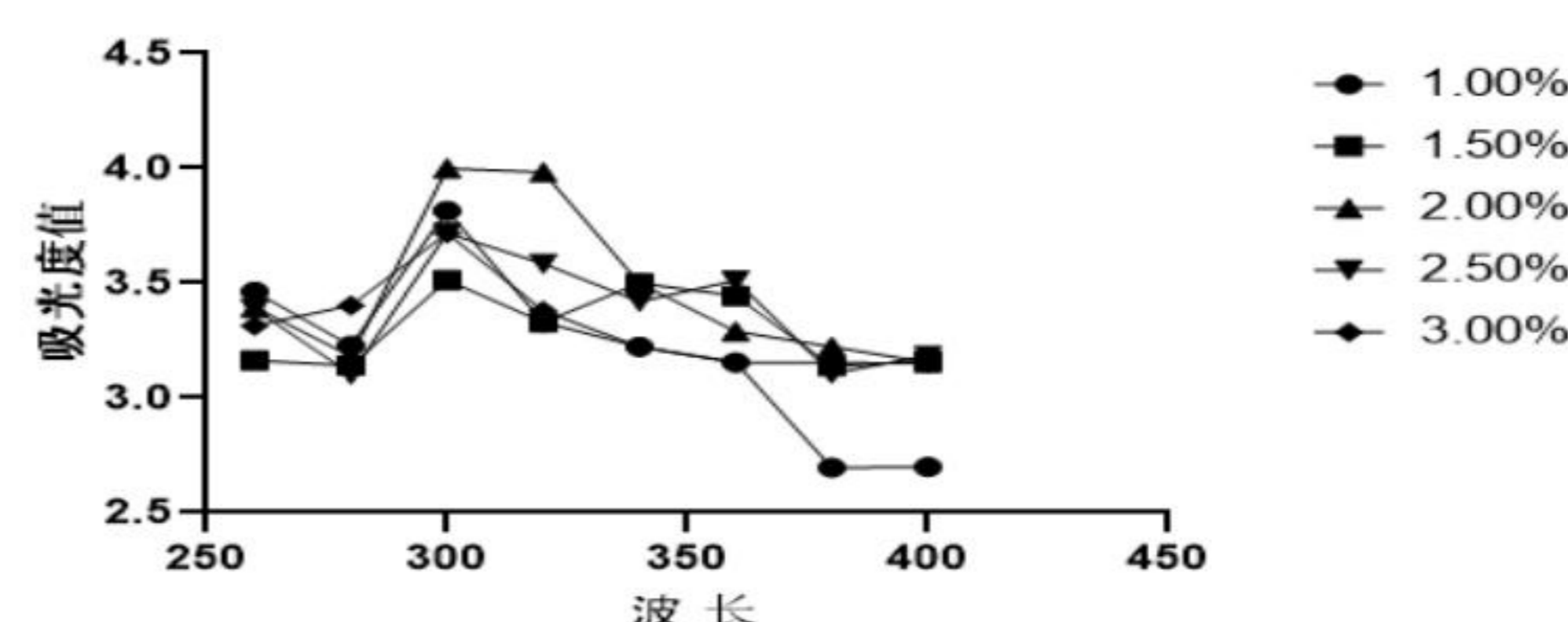


Fig.3 Absorption at different wavelengths of cucumber seed oil with different contents