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Qualitative phytochemical analysis of garlic (*Allium sativum*) and nilavembu (*Andrographis paniculata*)

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Abstract
The present study investigates the qualitative analysis of the major bioactive constituents or phytochemical of medicinally important plant such as garlic (*Allium sativum*) and nilavembu (*Andrographis paniculata*) in its aqueous solution. The phytochemical tests were conducted using standard methods of analysis. The result of the phytochemical screening showed the presence of saponin, terpenoid, flavonoids, amino acid and protein, volatile oil and cardiac glycosides, whereas nilavembu contains saponin, tannin, phenol, alkaloids, terpenoid, phlobatannin, volatile oil, hydrolysable tannin and glycosides. Vitamin C was absent in both garlic and nilavembu.

Keywords: *Allium sativum*, *Andrographis paniculata*, phytochemicals screening, tannin

1. Introduction
Commercial broiler is one of the fastest growing birds, its growth and development are a dynamic processes. Presently a need has arisen to completely avoid usage of antibiotics in poultry feeding due to increasing consumer concern for poultry drug residues in meat and egg. Hence, an alternative to antibiotics like probiotics, prebiotics, synbiotics and phytobiotics are being tried in poultry rations to improve growth, productivity and immunity against diseases. In this connection, phytobiotic such as, garlic (*Allium sativum*) and nilavembu (*Andrographis paniculata)* could be used as an alternative. It is expected to produce positive effects on production parameters and immune responses.

Garlic is a spice proven as herbal medicine for the prevention and treatment of various diseases. It has anti-bacterial, anti-viral, anti-fungal, anti-protozoal, anti-cancer, anti-oxidant, immunomodulatory, anti-inflammatory, hypoglycemic and hypocholesterolemic effect. (Rehman and Munir, 2015) [16]. Allicin has been reported as the principal compound in aqueous garlic extract or raw garlic homogenate responsible for cholesterol-lowering effect in humans and animals. When raw garlic bulb is chopped or crushed, the enzyme allinase activates alliin, a non-protein amino acid present in the intact garlic, to produce Allicin. (Chowdhury *et al.*, 2002) [4]. The phytochemical screening of garlic revealed presence of chemical compounds such as saponin, tannin, carbohydrates, cardio glycoside, alkaloids, flavonoid, phlobatannin and glycoside (Pavni *et al.*, 2011) [14].

Nilavembu (*Andrographis paniculata*) is known in North–Eastern India as Maha – tikta literally meaning "king of bitters". As an Ayurveda herb it is known as Kalmegh or Kalamegha, meaning “dark cloud”. The herb and its isolates like andrographolide, neoandrographolide, dehydroandrographolide, isoandrographolide, etc. are reported to possess anti-inflammatory, hepato-protective, astringent and anti-pyretic properties and helps in arresting dysentery, influenza and bronchitis. The phytochemical analysis of Nilavembu revealed the presence of various compounds such as steroids, alkaloids, flavonoids, triterpenoids, tannins, saponin, quinone, coumarin, protein, sugar and gum (Salna *et al.*, 2011) [17]. Considering the above points the present study was conducted to study the phytochemical analysis of garlic and nilavembu.

Materials and methods
Collection of garlic and nilavembu
The raw garlic and nilavembu powder were collected from local market, Mulakadai, Tamil Nadu, India. The collected garlic were washed with running tape water and distilled water.

Washed garlic was shade dried at room temperature for 3-5 days and grinded into fine powder.

Preparation of aqueous extracts

About 10 g of dried garlic and nilavembu powder were mixed with 100 ml of sterile distilled water and kept on a water bath shaker for 12 h at 40 °C. Thereafter, it was filtered through Whatman No 1 filter paper, then the filtrate was collected and used for preliminary chemical analysis.

Phytochemical screening

Garlic and nilavembu extracts thus obtained were analyzed to preliminary phytochemical screening following the standard protocols. Presence of alkaloids and flavonoids were estimated according to the method described by Harborne (1973) and Edeoga *et al.* (2005) [5], respectively. Saponins and tannins were analyzed using the method described by Farnsworth (1966) [6]. Glycosides were estimated using the method adopted by Haborne (1973) and other phytochemical constituents are Steroids, terpenoids and Triterpenoids followed by Siddiqui and Ali (1997) [18]. Sugars/ charbohydrate using Benetic's test, phenol by Ferric chloride test, protein estimation done by Lowry's method (Siddiqui and Ali, 1997) [18].

Results and discussion

Qualitative phytochemical composition of garlic and nilavembu is presented in Table 1 and qualitative analysis are shown in plate 1. The phytochemical analysis of garlic revealed the presence of saponin, terpenoid, flavonoids, amino acid and protein, volatile oil and cardiac glycosides, whereas nilavembu contains saponin, tannin, phenol, alkaloids, terpenoid, phlobatannin, volatile oil, hydrolysable tannin and glycosides. Vitamin C was absent in both garlic and nilavembu.

Table 1: Qualitative phytochemical analysis of garlic and nilavembu

S. No	Inference	Result	
		Garlic	Nilavembu
1	Saponin Foam will remain for 10 mints, presence of Saponin	+++	+
2	Tannin Blue or green colour indicates presence of tannin	–	+++
3	Phenol Dark blue colour indicates presence of phenol	–	+++
4	Alkaloids Orange indicates presence of alkaloids	–	++
5	Terpenoid Brown colour ring formation at the junction of two liquid indicates the presences of Terpenoid	++	+++
6	Flavonoids Intense yellow colour appears Then yellow colour disappears	+	_
7	Amino acid and protein Violet colour indicates presence of protein	+++	–
8	Carbohydrate Red precipitate indicates the presence of carbohydrate	–	–
9	Phlobatannins Red precipitate indicates the presence of phlobatannin	–	+
10	Volatile oil White precipitate indicates presence of volatile oil	+++	+
11	Hydrolysable tannin Emulsion formation precipitate indicates the presence of hydrolysable tannin	–	++
12	Glycosides Brick red precipitate indicates presence of glycosides	–	++
13	Cardiac glycosides Formation of three layer of different color indicates the presence. Upper layer - Green color Middle layer – Brown color Lower layer – Violet.	+++	_
14	Vitamin C Violet colour presence of Vit C	–	–

+++ High concentration of the compound ++ Moderate concentration of the compound
+ Low concentration of the compound _ Absence of the compound

The phytochemical screening of garlic extract revealed the presence of saponin, terpenoid, flavonoids, volatile oil, amino acid and protein and cardiac glycosides. However, tannin, phenol, alkaloids, carbohydrate, phlobatannin, hydrolysable tannin and Vitamin C were absent in garlic. This finding is in agreement with Mikail (2010) [11] who reported the presence of saponin, carbohydrates, cardiac glycoside in garlic, however alkaloids, flavonoid and glycoside were found to be absent. Similar result was also observed by Olusanmi and Amadi (2010) [12], Pavni *et al.* (2011) [14] and Huzaifa *et al.* (2014) [10] who reported that garlic bulb had flavonoids, saponin and cardiac glycosides. On contrary, Abdullahi *et al.* (2014) [1] reported that tannin and phlobatannin were present in garlic extract.

The phytochemical screening of nilavembu confirmed the presence of saponin, tannin, phenol, alkaloids, phlobatannin, volatile oil, hydrolysable tannin and glycosides. This finding was in agreement with the earlier reports of Salna *et al.* (2011) [17], Alagesaboopathi and Sivakumar, (2011) [2] and Balakrishnan *et al.* (2013) [3].

Saponins are steroid or triterpenoid glycosides characterised by their bitter or astringent taste, foaming properties and their

haemolytic effect on red blood cells. Saponins possess beneficial (cholesterol-lowering) properties and also exhibit structure dependent biological activities (Osagie and Eka, 1998) [13]. Saponins cause a reduction of blood cholesterol by preventing its reabsorption (Prohp and Onoagbe, 2012) [15].

Flavonoids are water soluble polyphenolic molecules and therefore belong to the polyphenol family. Flavonoids have antioxidant activities as well as much health promoting effects *viz.*, anti-allergic, anti-cancer, anti-oxidant, anti-inflammatory, anti-thrombotic, vasoprotective, tumour inhibitory and anti-viral effects. These effects have been associated with the influence of flavonoids on arachidonic acid metabolism. Some flavonoid containing plants are diuretics (e.g. buchu), anti-spasmodic (e.g. liquorice) and others have antimicrobial properties (Trease and Evans, 2002) [19].

Tannins present in nilavembu may decrease protein quality by decreasing digestibility, and palatability. Other nutritional effects which have been attributed to tannins include toxicity of tannins absorbed from the gut and interference with the absorption of iron and a possible carcinogenic effect (Osagie and Eka, 1998) [13].

The presence of alkaloids in nilavembu and Garlic (*Allium sativum)* aqueous bulb extract in this study shows the potential of the extract to have an analgesic, anti-inflammatory and adaptogenic effects, which help the host (man and animal) to develop resistance against disease and endurance against stress (Gupta, 1994) [7]. These could be possible as the root extracts contains some antibacterial activities. The flavonoids are acting on bacteria by inhibiting its protein synthesis (Hong-xi and Song, 2001) [9].

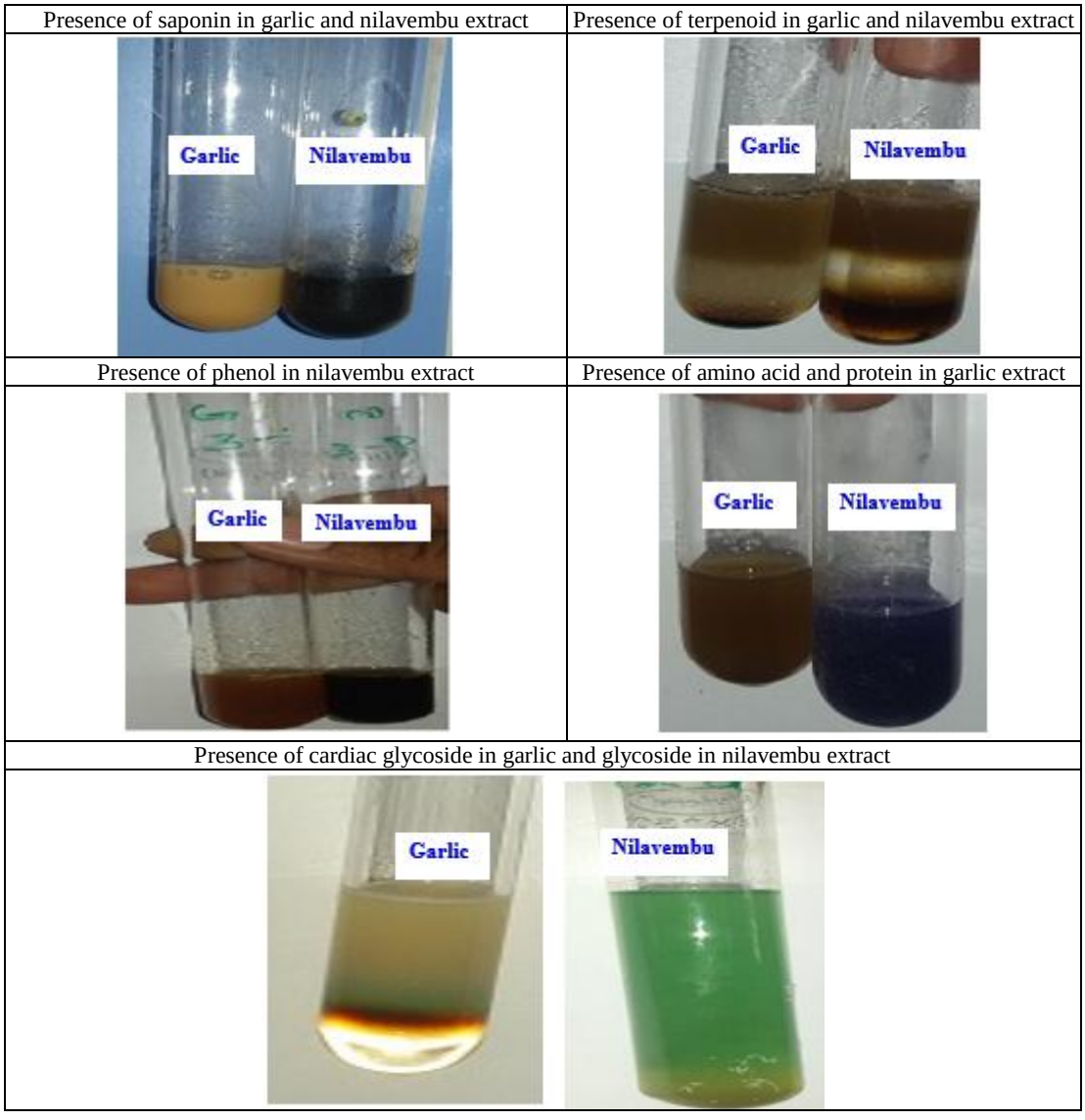

Fig 1:

Conclusion

This study shows that aqueous extract of garlic (*Allium sativum*) and nilavembu (*Andrographis paniculata*) contain important and active phytochemical compounds which may be utilized as an alternative to antibiotics in the livestock and poultry feeds.

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