Abstract

Cumin (*Cuminum cyminum L.*) is one of the oldest species of spice. Cumin seeds are used as a spice with a distinctive flavor and are traditionally added to chili, curries, and other food preparations. India is the world's largest producer and consumer of cumin. In addition to India, it is cultivated in North Africa, China, and the United States The most dreaded disease in the cumin crop is Fusarium wilt caused by *Fusarium oxysporum f.sp. cumini*, and it is a significant production constraint for cultivating the cumin crop in Gujarat as in India. Cumin is severely affected by Fusarium wilt caused by soil-borne pathogens resulting in yield losses of up to 80% depending on the severity of the infestation. The maximum population of Foc is estimated to be 0–5 cm in soil depth when crops are present. Soil inoculum density increases with each year of cumin cultivation and is directly proportional to disease incidence in the field. This investigation provides information on the isolation, identification, and characterization of cumin wilt-causing pathogen *Fusarium oxysporum* and cumin blight-causing pathogen *Alternaria burnsii*, re-isolation of the pathogen according to Koch's postulates, evaluation of plant extract against pathogens in vitro as well as pot trail methods, and Biochemical analysis of selected plant extract. Cumin-infected plant samples were brought to the lab for additional study and microscopic analysis. Koch's hypotheses have been confirmed with regard to the identification of fungi. From contaminated plant components, isolation was achieved. By using the hyphal tip culture technique, *A. burnsii's* culture was purified on PDA media. Cultural characteristics, as well as the conidiophore and conidia shape, confirmed the test pathogen's identity. For the eco-friendly management of this disease, sixteen different plant species were utilized. Crude plant extracts were prepared in water, acetone, and cow urine as solvents at different concentrations (5%, 10%, and 15%). The in vitro antifungal activity of these plant extracts was determined by the poisoned food technique. All the plants exhibited significant antifungal activity against both pathogens. The highest inhibition was recorded in plant extract extracted in acetone and followed by the plant extract extracted in cow urine. The antifungal activity of plant extract extracted in cow urine is the first investigation of this study. It was found that the highest in-vitro inhibition was recorded by *Azadirachta indica* (65.05%) and followed by *Mimuspos elengi* (63.73%) extracted in water, 69.63% by

Azadirachta indica and followed by *piper betle* (68.32) extracted in acetone and 67.05%, the highest inhibition was recorded by Neem, followed by Betel leaf (64.81%) extracted in cow urine at 10% concentration (at $p \leq 0.01$) against *Alternaria burnsii*. The highest efficacy of plant extract against *Fusarium oxysporum* was recorded by *Mimuspos elengi* (65.93%) and followed by *Azadirachta indica* (65.65%) extracted in water, *Mimuspos elengi* (72.45%) and *Azadirachta indica* (71.54%) extracted in acetone, and Azadirachta *indica* (69.35%) followed by *Mimuspos elengi* (*Mimuspos elengi*) extracted in cow urine. The pot experiment also revealed that the highest efficacy was recorded by the plant extract extracted in acetone and cow urine. In this investigation, we have correlated the efficacy of selected plant extract with compounds like protein, total sugar, phenol and chlorophyll content responsible for potential nutritional and defensive purposes. The analysis was performed by utilizing standard procedures and techniques. According to the findings, *Azadirachta indica, Mimuspos elengi, piper betle, Annona reticulata, Adhatoda vasica, Psidium guajava,* and *Millettia pinnata* extract are rich in phytochemicals that have the ability to fight against the plant disease.