rejection of transplanted organs and tissues is also mediated by the activated T cell through cell-mediated lysis or indirectly by antibody production enhancement or complement activation. Therefore, natural compounds that suppress the activated T cell could be considered as lead immunosuppressive drug.[33] In the present study, the new compound; 29 (30)-lupene-3, 20-diol; 3 β-form, 29-Aldehyde (4) significantly repressed cell proliferation (IC_{50} of 8.7 µg/Ml). Although both ß-sitosterol glucopyranoside (5) (IC_{50} of 16.7 µg/mL) and ß-sitosterol (2) (IC_{50} of 23.6 µg/mL) exerted moderate effect, it was observed that the glycosylated ß-sitosterol exhibited significantly higher activity that the aglycone form. This observation may be explained, in part, by their physicochemical properties including appropriate lipophilicity.[32] ß-sitosterol has been found to be effective in modulating the secretion of pro/anti-inflammatory cytokines.[34] The immunomodulatory effects of glycoside ß-sitosterol have also been reported earlier.[35] Additionally, clinical trials have been conducted which established the immune-modulatory effects of ß-sitosterol with limited toxic profiles in low doses.[36] However, it has been linked with several toxicity symptoms at high concentrations.[37,38] Together with this finding, our results are in well correlation with the literature showed that both beta-sitosterol and ß-sitosterol glucopyranoside exhibited immune modulation effect.

Many anticancer natural lead compounds fail to participate in the drug development process due to their side effects, which is more than their beneficial effect.[39] As such, any compound which has selective behavior in cancer cells, without harming normal cells will be of high significance. Triterpenoids exhibit remarkable and diverse physiological and therapeutic actions such as antiangiogenic and dedifferentiation effects that are related with anticancer actions.[40] They are even found to be a cancer reversal drug from multidrug resistant cancers.[41-43] It is interesting to note that the anticancer effects of triterpenoids have emerged as a selective apoptosis inducer in breast cancer cells while sparing normal cells.[40] In the present study, betulin followed by the new compound (29 [30]-lupene-3, 20-diol; 3 β-form, 29-Aldehyde) exhibited a significant anticancer effect against the Hela cell line and were proven to be not toxic to normal cell. A previous study had shown that betulin was capable of selective apoptosis induction on invasive breast cancer.[44] In addition, it was found to exhibit potent antitumor potential[45] and apoptosis induction in several other cancer cells, including glioblastoma, leukemia, and lung carcinoma.[46,47] Our results in the current research are in well agreement with the literature indicating that the terpenoids as a phytochemical class with individual phytochemicals having significant anticancer potential.

CONCLUSION

We have isolated a new and four known triterpenoids from the stem bark of *G. flavescens*, which were evaluated for immunomodulatory and cytotoxicity properties. Among all isolated and tested compounds, the new compound; 29 (30)-lupene-3, 20-diol; 3 β-form, 29-Aldehyde (4) significantly interferes with the adaptive immune response (T-cell proliferation). It inhibited the PHA-activated T-cell with an IC_{50} of 8.7 µg/mL. ß-sitosterol and its glycoside form exerted moderate activity. Moreover, betulin and the new compound, respectively, exerted significant anticancer activity against the Hela cell line while ß-sitosterol and lupeol also exhibited considerable anticancer property but with lower effect than the former two compounds.

Taking together all these results, we would like to conclude that *G. flavescens* has a good potential for future studies which might focus in other phytochemicals from the plant and animal model-based studies, which could bring more mechanistic facts about this plant activity.

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Conflicts of interest

There are no conflicts of interest.

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