Anticoagulant Activity of Some Medical Plant Extracts Such as Green Tea, Turmeric Root Vegetable Fresh and Jalapeño Peppers Fruit Fresh

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Abstract

The clotting qualities of three pharmaceutical plants green tea, jalapeño peppers, and turmeric root vegetables are investigated during this investigation. The anticoagulant effectiveness associated with the plant's hot water extraction (THWE) has been examined by evaluating the coagulation time. The turmeric extract demonstrated a slight significant difference among the volumes of 0.5 ml and 1 ml and an apparent significant variance within the volumes of 0.5 ml and 1.5 ml, the green tea extract also demonstrated an important distinction among the amount present of 1.5 ml that contained the substance and the one in the control tube. Additionally, the pepper extract demonstrated a significant distinction across the volumes of 0.25 ml and 0.5 ml and a clear significant difference between the volume of 0.5 ml and 1 ml. The aforementioned plants could be offering alternative methods for controlling blood coagulation and lowering the risk of clot-related illnesses because of various bioactive components. recommended to conduct further research targeting such medicinal plants that have a significant impact on human health, includes more investigation into their modes of action and therapeutic uses is required.

Keywords: Medical plant, Anticoagulant , Green Tea , Turmeric root vegetable fresh and jalapeño peppers fruit fresh.

1. Introduction

The hemostasis is known as a mechanism by which thrombosis and anticoagulant medications cooperate to keep bleeding in the damaged system of circulation during injury (Sirridge & Shannon, 1993). It is a complicated process with 3 primary phases: (1) The constriction of platelet insertion temporarily; (2) obstructing a break; and (3) coagulation of the blood, or the development of a clot made of fibrin. Anticoagulant medication medications are required for both the ongoing avoidance of recurrences as well as for the immediate therapy of vascular and artery coagulant diseases (Pallister & Watson, 2010). Despite being the cornerstone of therapy with anticoagulants for decades, the heparin has certain therapeutic constraints, including ineffectiveness among individuals with anticoagulants deficiency, problems with bleeding, the possibility of heparin-related thrombocytopenia, immune suppression, and becoming osteoporotic effects over an extended period of time (Long et al., 2016; Pallister & Watson, 2010). Therefore, it is crucial to look for novel compounds having anticoagulant and antithrombotic properties (Long et al., 2016; Moll & Roberts, 2002; Pallister & Watson, 2010). Traditionally, hemorrhagic and antithrombotic compounds were initially found within plants used for medicinal purposes (Moll & Roberts, 2002). Consequently, investigating alternate anticoagulant medications is both necessary and urgent. Since herbs constitute a safer alternative to medication, researchers conducted an anticoagulant study on water-soluble extracts of a few chosen medicinal plant species, including fresh jalapeño peppers (Capsicum annuum), fresh turmeric root vegetable (Curcuma longa. L.), and camellia sinensis (green tea).

2. Materials and Methods

2.1 Materials and Equipment

Heated that includes a magnet stirrer, centrifuges, Capillary's tubes, test tubes, slide made of glass, five-micron syringes, needles, cotton, filter paper, Sprite, Green tea, jalapeño peppers, turmeric, and micropipettes.

2.2 Collection and processing of plant

Through October to December 2024, specimens of freshly harvested turmeric root plants (Curcuma longa L.), fresh jalapeño pepper berries (Capsicum annuum), with Camellia Sinensis (green tea) were bought from regional grocery stores in Karbala City. For future use, specimens from vouchers were placed in the Biological Sciences lab. After being cleaned and sliced through small fragments with an industrial cutter, the gathered plant materials were then preserved at a comfortable temperature inside dark, sealed containers. For later usage, the balance of new specimens that would be utilized in the conventional extraction process were frozen in airtight plastics.

2.3 Extraction

Hot water extraction (THWE) of Camellia Sinensis (Green Tea): Green Tea is purchased them through the neighborhood supermarket. Ten grams of dried green tea plants had been measured using a sensitive balance, and after five minutes were immersion in sterile distilled water, they were steeped in ninety-five percent ethanol for three minutes to render the particular species sterile. The alcohol was subsequently eliminated by drying it for ten minutes. The resulting solution then passed through the filter paper made by Whatman No. 1 to get rid of any difficult fragments, and the mixture went through a centrifuge for 10 minutes at three

thousand revolutions per minute after being extracted with 200 ml of distill water that was at a steady temperature of 95 °C for two hours while being continuously stirred by a magnetic stirrer. Green tea crude extracts, the supernatant were kept between 2 and 4 °C until analysis (Norsworthy et al., 2010). Hot water extraction (THWE) of Turmeric root vegetable Fresh. (Curcuma longa. L.), and then supernatant was subsequently filtered through Whatman No. 1 filter pap to render the particular species uncontaminated, ten grams of fresh turmeric root vegetables were bought from the local vegetable market, measured utilizing a delicate scale, and then steeped for thirty seconds in sterile water from distillation before being soaked for an additional three minutes in ninety-five percent ethanol. The solvent, ethanol, was subsequently evaporated by drying the turmeric for ten minutes. Dried turmeric was subsequently ground using a sterile mixer and recovered with two hundred milliliters of water from distillation while being continuously stirred using a magnetic stirrer during 2hours at a constant ambient temperature of 95°C to remove rough particles, and then centrifuged at 3,000 rpm for 10 min. The supernatant, called Turmeric crude extracts (TE) was stored at 2–4 °C until analyzed (Norsworthy et al., 2010). Hot water extraction (THWE) of jalapeño peppers fruit Fresh (Capsicum annuum): Ten grams of fresh jalapeño peppers had been purchased form the local vegetable market, weighted using a pressure delicate scale, and then steeped with sterilized water that was distilled for five minutes before being submerged within ninety-five percent ethanol for three minutes to sterilize the particular variety. The alcohol was subsequently eliminated by drying the jalapeño peppers for ten minutes. The drying jalapeño peppers were subsequently ground in a sterile mortar and extracted with 200 milliliters of distilled water (DW) while being continuously stirred utilizing a magnetic stirrer for two hours at an ongoing temperature of 95 °C., subsequent the resulting solution went through a centrifuge about 10 minutes at 3,000 rpm after passing through using Whatman No. 1 filter paper to get rid of any harmful particles. Before analysis, the supernatant, known as jalapeño peppers crude extracts (JPE), was kept between 2 and 4 °C until analyzed (Norsworthy et al., 2010).

Anticoagulant Experiment

In order to assess the anticoagulant properties of plant extracts, blood from individual's samples were drawn and placed in a standard test tube. Different amounts of pure botanical extracts were then added, as indicated in Table 1. Experiments were continuously stirred and observed while being stored at the ambient temperature. By visual comparison with the control sample (the conventional test tube that contained simply a blood sample), the presence of clots was confirmed. The experiments took place again for a number of corresponding volumes using the identical additives as indicated in order to validate the outcomes of the tests.

2.4. Statistical Analysis

SPSS Statistics 17.0 software package (SPSS Inc., 233 South Wacker Drive, 11th Floor, Chicago, IL) was used for descriptive statistical analysis.

3. Results

The anticoagulant activity of the plant extract was evaluated by assessing its effect on blood clotting at different volumes in Table 1. The extract demonstrated a volume-dependent impact on coagulation, with higher volumes leading to a prolonged clotting time. This suggests that the bioactive compounds present in the extract may interfere with the coagulation cascade, potentially inhibiting clot formation. These findings indicate the extract's potential as a natural anticoagulant, which could be explored further for therapeutic applications in preventing blood clot-related disorders. Figure 1- A reveals the effects of green tea extract at different volumes (0.25, 0.5, 1 ml) on blood clotting time, there was no a significant difference between the apparent volume of 0.25 ml of the extract and the control tube, but there was a significant difference between the volume of 0.5ml of the extract and the control tube, and there was a significant difference between the volume of 1ml of the extract and the control tube. However, there was a slight significant difference between the volume of 0.25 and 0.5and there was a clear significant difference between the volume of 0.5 and 1ml. Figure 1-B reveals the effects of turmeric extract at different volumes (0.5, 1, 1.5) on blood clotting, there was no a significant difference between the apparent volume of 0.5 ml of the extract and the control tube, but there was a slight significant difference between the volume of 1ml of the extract and the control tube, and there was a significant difference between the volume of 1.5ml of the extract and the control tube. However, there was a slight significant difference between the volume of 0.5 and 1 and there was a clear significant difference between the volume of 0.5 and 1.5 ml. Figure 1-C reveals the effects of pepper extract at different volumes (0.25, 0.5, 1ml) on blood clotting, there was no significant difference between the apparent volume of 0.25 ml of the extract and the control tube, but there was a significant difference between the volume of 0.5ml of the extract and the control tube, and there was a significant difference between the volume of 1ml of the extract and the control tube. However, there was a significant difference between the volume of 0.25 and 0.5 and there was a clear significant difference between the volume of 0.5 and 1 ml.

Table 1: Showing the results of the volumes of plant extracts added (Green tea, Turmeric, and Pepper) and blood clotting time

plant extract	volumes	coagulation time 1	coagulation time of control
Green tea	1 ml blood+ 0.25 ml extract	10min	10 min
	1 ml blood+ 0.5 ml extract	15min	10 min
	1ml blood+ 1 ml extract	18min	10 min
Turmeric	1ml blood+ 0.5ml extract	10 min	10 min
	1ml blood+ 1 ml extract	15 min	10 min
	1ml blood+ 1.5 ml extract	30 min	10 min
Pepper	1ml blood+ 0.25ml extract	10min	10 min
	1ml blood+ 0.5 ml extract	30min	10 min
	1ml blood+ 1 ml extract	60min	10 min

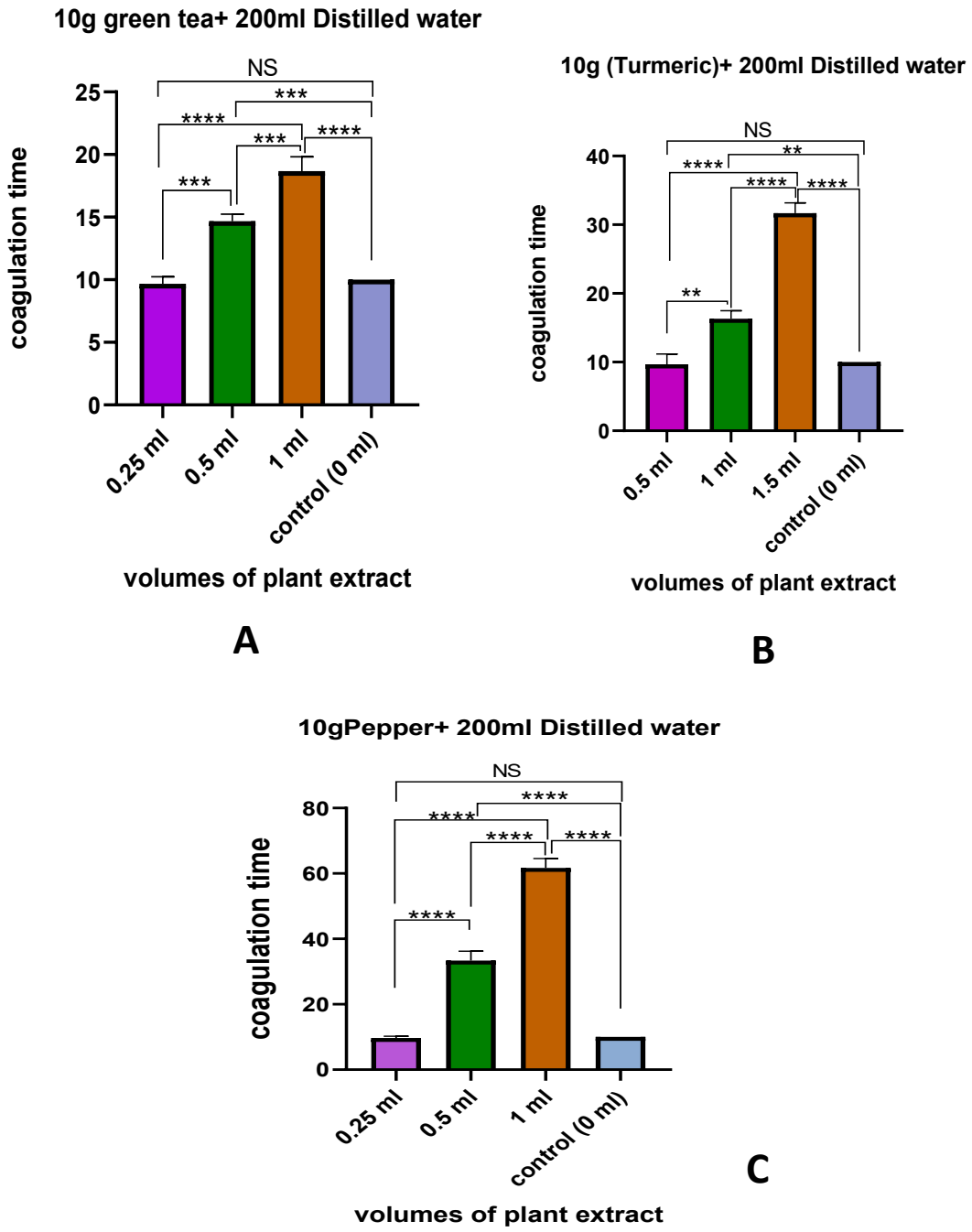

Figure 1. Result of blood clotting time and the volume of plant extracts added. (A) reveals the effects of green tea extract at different volumes (0.25, 0.5, 1 ml) on blood clotting time, (B) reveals the effects of turmeric extract at different volumes (0.5, 1, 1.5) on blood clotting, (C) reveals the effects of pepper extract at different volumes (0.25, 0.5, 1ml) on blood clotting

4. Discussion

One vital physiologic mechanism that stops bleeding that is excessive is coagulation in the blood. Also, thrombotic conditions like strokes and extensive vein thromboembolism can result from insufficient anticoagulation (Wang et al., 2007). Though chemical drugs like warfarin and heparin have a tendency to cause hemorrhaging anticoagulation medicines are frequently utilized to treat these diseases. Potential endogenous anticoagulation supplies have

been discovered identified in medicinal plants (Kang et al., 1999; Srivastava & Justesen, 1987). Among these, they have generated an abundance of interest because of their possible medical uses in avoiding conditions linked to blood clots. These plants have bioactive substances that have anticoagulation effects via influencing several coagulation-related mechanisms(Shivalingu et al., 2015; Unnikrishnan & Nishteswar, 2015).

Green Tea is one of the most popular drinks produced worldwide. Originating in Southeast China, the tea plant (family Theaceae) has progressively spread to India, Sri Lanka, and numerous other tropical and sub-tropical nations (Son et al., 2004). Around 30 countries around the entire globe manufacture tea. Popular with consumers as a health-promoting product, green tea's positive effects have been linked to its polyphenol content, namely to the catechins and flavonoids, which support its anticoagulant qualities (Anand et al., 2012; Lee & Bong, 2022; Shivalingu et al., 2015). These compounds lower the likelihood of an overproduction of blood clot by inhibiting the formation of platelets and modifying the action of clotting factors. Epigallocatechin gallate, or (EGCG), another compound found in green tea, was previously shown to affect fibrinolytic capacity and reduce the production of thrombin . Green tea should be used carefully in medical settings since excessive amounts may interact with anticoagulant drugs like anticoagulation. Another study was showed that EGCG prevented individual platelet from aggregating when thrombosis and protein were present (Kang, 2010). Additionally, green tea extract has been proven to decrease clot formation in rat models (Chacko et al., 2010). Fortunately, not all catechins that are similarly readily accessible, and the dosage and method of consumption have a big influence on the outcome. restricted and erratic (Kuriyama et al., 2006; Sakata et al., 2011). Although direct anticoagulation properties on individuals have not been proved, certain epidemiological investigations link increased green tea administration to decreased cardiovascular risk (Rietveld & Wiseman, 2003).

Turmeric root comprises a vivid orange-yellow root belonging to the Zingiberaceae family, which includes ginger. Curcumin, the main ingredient in the spice turmeric, has strong anti-inflammatory, anticoagulant medication, and antioxidant functions (Mayanglambam et al., 2010). By preventing the accumulation of platelets and reducing the production of coagulation proteins, turmeric, and especially its main component turmeric, has strong anticoagulant properties (Madhyastha et al., 2010). It has been demonstrated that curcumin inhibits the production of fibrin and thrombin, two crucial elements of the coagulation cascade (Chakraborty et al., 2011). The anti-inflammatory effects of turmeric can additionally enhance cardiovascular wellness by lessening inflammation, which is a major cause of blood clots (Choudhary & Sekhon, 2012). Turmeric is frequently suggested as a natural treatment for heart disease because of its blood-thinning qualities, however people on anticoagulants need to exercise precaution when using it (Mayanglambam et al., 2010). Curcumin reduces the accumulation of human platelets caused by ADP as well as collagen, as shown by (Kim et al., 2012). Curcumin, at the same time, was recently demonstrated to have a protective effect against coagulation in rat models by extending bleeding and clotting time. Although there aren't many extensive clinical studies available, reports of incidents and minor research indicate curcumin may raise the risk of bleeding and intensify the adverse consequences of anticoagulant medicines like warfarin (Aggarwal et al., 2007; Hewlings & Kalman, 2017). According to one observational investigation, patients on anticoagulation who took supplementation containing curcumin had higher INR levels (Zhou et al., 2011).

Jalapeños scientific is an assortment plants belonging to the botanical genus Capsicum. Although it comes predominantly from the nation of Mexico, capsaicin annum can be discovered all over the world. The spicy as well as unpleasant taste of capsicum annum is well-known. The ingredient that gives jalapeño peppers (Capsicum annuum) their distinctive flavor, capsaicin, is the main reason they are regarded as a therapeutic plant. It contains capsaicin, a bioactive substance with anti-inflammatory and vasodilation properties. Capsaicin could possess anticoagulation properties via enhancing circulation of blood while lowering the accumulation of platelets, even though it does not directly inhibit clotting factors like curcumin or catechins. Jalapeños also contain a lot of vitamin C, an antioxidant which indirectly affects the development of blood clots by preserving the function of endothelial cells and lowering oxidative stress. Nevertheless, in comparison to curcumin and green tea, the anticoagulant properties of jalapeño peppers have received less research. The anti-thrombotic properties of cayenne pepper extract on type O+ individual specimens were examined and published. The researchers observed that increasing volumes of the extract (0.10 mL, 0.20 mL, and 0.30 mL) corresponded to prolonged clotting times. Particularly, the extract measured in 0.30 mL proved particularly effective, suggesting a potent anticoagulation action. According to the the research's findings, extraction from cayenne pepper (Capsicum annuum) has strong anti-thrombotic effects and may be used as a substitute anticoagulation (Daluddung, 2019). Both the anticoagulant as well as antimicrobial activities of extracts from Capsicum annuum (Pusa Jwala variety) were assessed in a different investigation. At thirty-one percent, the solution of methanol extract exhibited the highest clot lysis activity, followed by extracts made from water (21%), acetone (21.2%), and chloroform (25.1%). These results imply that the herb capsicum annuum contains substances that can aid in the breakdown of clots (Aldayel, 2023).

5. Conclusion

Green tea, turmeric, and jalapeño peppers all have anticoagulant properties through various mechanisms, such as vasodilatory effects, blood clotting regulation, and suppression of platelet aggregation. Although these natural plant extracts might be used in tandem with pharmacological anticoagulant medications to treat blood clot-related conditions, it is important to cautiously evaluate how they might interact alongside these medications. For an understanding of precisely how they work including their beneficial applications in healthcare settings, more investigation is required.

References

Aggarwal, B. B., Sundaram, C., Malani, N., & Ichikawa, H. (2007). Curcumin: The Indian solid gold. In B. B. Aggarwal, Y.-J. Surh, & S. Shishodia (Eds.), *The molecular targets and therapeutic uses of curcumin in health and disease* (pp. 1–75). Springer Science + Business Media. https://doi.org/10.1007/978-0-387-46401-5_1

Aldayel, M. F. (2023). The synergistic effect of capsicum aqueous extract (Capsicum annuum) and chitosan against multidrug-resistant bacteria. *Journal of King Saud University - Science*, *35*(2), 102459. https://doi.org/10.1016/j.jksus.2022.102459

Anand, J., Rai, N., Kumar, N., & Gautum, P. (2012). Green tea: A magical herb with miraculous outcomes. *International Research Journal of Pharmacy*, *3*(5), 139–148.

Chacko, S. M., Thambi, P. T., Kuttan, R., & Nishigaki, I. (2010). Beneficial effects of green tea: A literature review. *Chinese Medicine*, *5*(1), 13. https://doi.org/10.1186/1749-8546-5-13

Chakraborty, P. S., Ali, S. A., Kaushik, S., Ray, R. K., Yadav, R. P., & Rai, M. K. (2011). Curcuma longa – A multicentric clinical verification study. *Indian Journal of Research in Homoeopathy*, *5*(3), 19–27.

Choudhary, N., & Sekhon, B. S. (2012). *Potential therapeutic effect of curcumin—an update*.

Daluddung, J. (2019). The anti-thrombotic property of cayenne pepper (Capsicum annuum) extract in type O+ human blood coagulation. *Ascendens Asia Journal of Multidisciplinary Research Abstracts*, *3*(2).

Hewlings, S. J., & Kalman, D. S. (2017). Curcumin: A review of its' effects on human health. *Foods*, *6*(10), 92. https://doi.org/10.3390/foods6100092

Kang, W. S. (2010). Epigallocatechin-3-gallate inhibits platelet activation. *Platelets*, *21*(1), 1–6. https://doi.org/10.3109/09537100903363922

Kang, W. S., Lim, I. H., Yuk, D. Y., Chung, K. H., Park, J. B., Yoo, H. S., & Yun, Y. P. (1999). Antithrombotic activities of green tea catechins and (-)-epigallocatechin gallate. *Thrombosis Research*, *96*(3), 229–237. https://doi.org/10.1016/S0049-3848(99)00104-5

Kim, D. C., Ku, S. K., & Bae, J. S. (2012). Anticoagulant activities of curcumin and its derivative. *BMB Reports*, *45*(4), 221–226. https://doi.org/10.5483/BMBRep.2012.45.4.221

Kuriyama, S., Shimazu, T., Ohmori, K., Kikuchi, N., Nakaya, N., Nishino, Y., Tsubono, Y., & Tsuji, I. (2006). Green tea consumption and mortality due to cardiovascular disease, cancer, and all causes in Japan: The Ohsaki study. *JAMA*, *296*(10), 1255–1265. https://doi.org/10.1001/jama.296.10.1255

Lee, H. J., & Bong, M. (2022). *Self-efficacy BT - International Encyclopedia of Education* (4th ed. P P - 250–257 (ed.)). Elsevier. https://doi.org/10.1016/B978-0-12-818630-5.14028-X

Long, A. T., Kenne, E., Jung, R., Fuchs, T. A., & Renné, T. (2016). Contact system revisited: An interface between inflammation, coagulation, and innate immunity. *Journal of Thrombosis and Haemostasis*, *14*(3), 427–437. https://doi.org/10.1111/jth.13235

Madhyastha, R., Madhyastha, H., Nakajima, Y., Omura, S., & Maruyama, M. (2010).

Curcumin facilitates fibrinolysis and cellular migration during wound healing by modulating urokinase plasminogen activator expression. *Pathophysiology of Haemostasis and Thrombosis*, *37*(2–4), 59–66. https://doi.org/10.1159/000321414

Mayanglambam, A., Dangelmaier, C. A., Thomas, D., Reddy, C. D., Daniel, J. L., & Kunapuli, S. P. (2010). Curcumin inhibits GPVI-mediated platelet activation by interfering with the kinase activity of Syk and the subsequent activation of PLCγ2. *Platelets*, *21*(3), 211–220. https://doi.org/10.3109/09537100903528215

Moll, S., & Roberts, H. R. (2002). Overview of anticoagulant drugs for the future. *Seminars in Hematology*, *39*(3), 145–157. https://doi.org/10.1053/shem.2002.34082

Norsworthy, J. K., Bangarwa, S. K., Scott, R. C., Still, J., & Griffith, G. M. (2010). Use of propanil and quinclorac tank mixtures for broadleaf weed control on rice (Oryza sativa) levees. *Crop Protection*, *29*(3), 255–259. https://doi.org/10.1016/j.cropro.2009.12.005

Pallister, C. J., & Watson, M. S. (2010). *Haematology*. Scion Publishing.

Rietveld, A., & Wiseman, S. (2003). Antioxidant effects of tea: Evidence from human clinical trials. *The Journal of Nutrition*, *133*(10), 3285S-3292S. https://doi.org/10.1093/jn/133.10.3285S

Sakata, R., Ueshima, H., Okayama, A., Saitoh, S., Nakagawa, H., Rodriguez, B., Okuda, N., & Stamler, J. (2011). Green tea intake and risks for thromboembolism: The INTERLIPID study. *Japanese Journal of Clinical Oncology*, *41*(6), 755–760. https://doi.org/10.1093/jjco/hyr045

Shivalingu, B. R., Vivek, H. K., Nafeesa, Z., Priya, B. S., & Nanjunda Swamy, S. (2015). Comparative analysis of procoagulant and fibrinogenolytic activity of crude protease fractions of turmeric species. *Journal of Ethnopharmacology*, *172*, 261–264. https://doi.org/10.1016/j.jep.2015.06.035

Sirridge, M. S., & Shannon, R. (1993). *Hematology: Principles and procedures* (6th ed.). Lea and Febiger.

Son, D. J., Cho, M. R., Jin, Y. R., Kim, S. Y., Park, Y. H., Lee, S. H., Akiba, S., Sato, T., & Yun, Y. P. (2004). Antiplatelet effect of green tea catechins: A possible mechanism through arachidonic acid pathway. *Prostaglandins, Leukotrienes and Essential Fatty Acids*, *71*(1), 25–31. https://doi.org/10.1016/j.plefa.2003.12.004

Srivastava, K. C., & Justesen, U. (1987). Inhibition of platelet aggregation and reduced formation of thromboxane and lipoxygenase products in platelets by oil of cloves. *Prostaglandins, Leukotrienes and Medicine*, *29*(1), 11–18. https://doi.org/10.1016/0262-1746(87)90057-3

Unnikrishnan, V., & Nishteswar, K. (2015). Antiplatelet Ayurvedic herbs in the management of cardiovascular disease—a review. *International Ayurvedic Medical Journal*, *3*, 1462–1473.

Wang, C. Z., Mehendale, S. R., & Yuan, C. S. (2007). Commonly used antioxidant botanicals: Active constituents and their potential role in cardiovascular illness. *The American Journal of Chinese Medicine*, *35*(4), 543–558. https://doi.org/10.1142/S0192415X07005053

Zhou, H., Beevers, C. S., & Huang, S. (2011). The targets of curcumin. *Current Drug Targets*, *12*(3), 332–347. https://doi.org/10.2174/138945011794815356