



Mini Review

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Our Health is in Our Plates

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To Cite This Article: Marwa Bannani and Mounir Trabelsi. Our Health is in Our Plates. Am J Biomed Sci & Res. 2023 18(1) AJBSR.MS.ID.002452,

DOI: [10.34297/AJBSR.2023.18.002452](https://doi.org/10.34297/AJBSR.2023.18.002452)

Received: 📅 March 10, 2023; Published: 📅 March 23, 2023

Keywords: Curcumin; Thymoquinone; Colorectal cancer; Antioxidant; Antiproliferative

List of Abbreviations: CUR: Curcumin; CRC: Cancer Colorectal; TQ: Thymoquinone

“Let food be your medicine and let your medicine be in your food”. This famous phrase of Hippocrates, centuries before Jesus Christ, is still relevant and remains valid for us today. Those who eat obviously will remain healthy, because only food contains intrinsic elements that allow the body to maintain good health [1]. So we should have good food hygiene if we want it to be our medicine. Today the reality is that poor food hygiene can very easily cost our health dearly [2]. Food is indeed a source of life, but it can also compromise our health. Food is considered by many to be a main source of disease [3]. Although it causes diseases caused by biological or chemical agents, many of us are completely unaware of these harms. There is an adage that says “Eat well, live better” [4].

A diet rich in vegetables, spices and fruits can prevent at least 20% of all types of cancer [5]. Mediterranean cuisine seems to meet these dietary requirements perfectly. This notion of Mediterranean diet is not a diet specific to a country or a population but encompasses large number of different cuisines that do not share the same lifestyles, cultures and religions. However, certain common characteristics bring their cuisine closer together, in a particular high consumption of vegetables and various fruits, fresh and dried, cereals and pulses. The use of olive oil as the main source of fat, a moderate consumption of red meat, offset by that of seafood products, a low consumption of milk and butter in favor of fresh cheeses make this geographical area a common culinary space.

Many Mediterranean dishes are known for the gustatory and olfactory pleasures they offer, through different aromas and flavours obtained from a mixture of herbs (rosemary, thyme, sage), condiments (bay leaf, mint, basil, ...) or spices (cinnamon, cumin, coriander, ginger, saffron...). All these herbs and spices are used, separately or combined for their flavors in the first place but are also known for their preventive and curative effects against certain

diseases including cancer which is the second cause of mortality and morbidity in the world (WHO 2017).

Many Tunisian dishes use one or more mixed spices, a know-how passed down from generation to generation. This spice mixture is used empirically, probably meeting taste criteria [6]. Among these spice mixtures we can mention one in a particular obtained from coriander, caraway, paprika, garlic. It is used for “couscous”, a dish known all over North Africa. Cumin is inseparable from fish. Turmeric is used to color and flavour sauces and fish. This list can still be extended reflecting an ancestral culinary wealth.

For centuries, evidence has proved that a great number of anticancer compounds derived from various plants are able to prevent or even reverse early-stage cancer progression [7]. Curcumin (CUR) or diféruoyl-méthane is a polyphenolic compound originally derived from the root of *Curcuma longa*. It's a yellow-coloured compound derived from turmeric that possesses biological functions including antimicrobial, anti-inflammatory and antioxidant actions [8]. Moreover, CUR has been shown to significantly inhibit the growth of many types of cancer cells. For our various tests, we used CUR, the active molecule of turmeric. Colorectal cancer (CRC) is the second worldwide leading cause of cancer death. In many countries, it is considered a public health problem. Therapeutic strategies of CRC mainly include adjuvant chemotherapy with fluorouracil and folinic acid, but these anti-cancerous chemicals' efficiency is not effective at all stages. It is even suggested that the survival benefit from chemotherapy does not outweigh the toxicity caused by these therapies [9].

In CRC research, CUR has suppressed carcinogenesis by decreasing inflammation-related genes expression and epigenetic modifications in vivo. Furthermore, it is recognized as a generally



safe compound by the Food and Drug Administration and its safety has been confirmed in human clinical trials [10].

Unfortunately, for most natural molecules obtained from the diet such as CUR, the short half-life and the hydrophobicity can lead to low bioavailability [11]. Indeed, a multiagent strategy of combination treatment using several bioactive components can be necessary. Combinational treatment with phytochemicals and anticancer drugs can avoid cancer recurrence and reduce the resistance of tumor cells to chemotherapeutic agents.

In fact, spices' combination might be a good solution to prevent CRC since it could strengthen the anticancer effect of each bioactive compound [12].

In Tunisian cuisine we have noted that the CUR is very often associated with black caraway, widely used in the folk medicine of the Middle East. Thymoquinone (TQ) is the bioactive phytochemical constituent from Black Caraway seed (*Nigella sativa*) and is TQ has promising pharmacological properties including antioxidant and anti-inflammatory. TQ is also shown to be effective against several cancer types, including colon, kidney, ovarian, and breast forms of cancers. The anticancer effect of this compound is mediated mainly by cell cycle arrest, induction of apoptosis, and synergism with other therapies. Here too, for our various tests, we used TQ, the active molecule of black caraway.

Although it was well documented that CUR and TQ displayed potent activity against CRC, their combined efficacy on HCT116 and HT29 cells has not been evaluated so far. The overlap between different signaling pathways is a common phenomenon for biological efficacy. Therefore, a combination of effective agents is the best way to improve the bio-efficiency by reducing the dose levels to make the therapeutic rate safer [13]. As far as we know, no studies comprising the role of TQ and CUR, separately or combined, on colorectal cell cancer has been reported.

To evaluate a possible anticancer efficacy of this mixture, we tested the combination of TQ and CUR on an *in vivo* culture of human cancer cells, HCT 116 and HT 29. These cell lines were cultured in DMEM. The antioxidant activity of compounds was evaluated using DDPH and ABTS. The cytotoxicity of CUR and TQ were analyzed by colorimetric MTT assay.

Antioxidants are very important in human health because they can have a major role in the prevention and treatment of many cancers [14].

Our result show the high antioxidant activity with DPPH of the combined compared to CUR and TQ separated. The test with ABTS confirms the previous result. The combination between the 2 spices is more antioxidant than if they had been taken separately.

CUR and TQ, taken separately, have an antiproliferative effect on cancer cells. In combination, their cytotoxic effect is multiplied by three.

According to our research, it clearly appears that the combination of these 2 spices improves their anticancer effect based on their antioxidant and antiproliferative action.

These results join other studies that have proven that certain combinations can have a synergistic effect increasing the preventive power of certain herbs and spices [3]. This study encourages us to draw inspiration from old cooking recipes, many of which have fallen into oblivion

Conclusion

To summarize, the results of this study clearly showed that the use of the combination of the bioactive compound of curcumin and Thymoquinone, as chemopreventive agents against colorectal cancer, could be a better and more promising source to treat and avoid colorectal cancer. This combination could also provide considerable benefits for health, not only in the treatment of cancer but also for diseases related to oxidative stress and reactive species production. Our study has shown for the first time that the combination of the dietary component CUR with TQ leads to synergistic inhibition of colon cancer cell growth.

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