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The Novel innovation oncurcumin: Nanoform for the treatment of cancer

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ABSTRACT :-
In view of the disparate therapeutic and pharmacokinetic propreties of curcumin. Itisleading in the medicinal, pharmaceutic, nutraceutical, cosmetics, and nutritional. These iscrucialbecause of lots of effect like as anti-inflamantory, wound relieve, anti-oxidant, anti-microial, cytoprotective, anti-cancer, &immunomodulatory effects. A major reason for the beneficial action of curcumin is the existence of identical yellow-colouredpolyphenolic compound known as "Curcumin". It is curing of multiple of disease likeascardiovascular and neurological disease, sugar diabetes, rheumatic & cancer. By using nanoformulationscurcumin& its result support to arrange new treatment modalities, particularly in cancer, a like the reason that of their best bioaccessibility& solubility of nanocurcumin while differentiate turmeric. These analyze handle the varied application of curcumin nanoparticles in cancer therapy and much aim realize which way that the immunological level of the cancer cell.
Keywords :-Curcumin, Nanoformulation, Cancer, turmeric, etc.

I. INTRODUCTION :

Haldi is the yellow colourpowdergained through the stem of Curcuma longa, is an important flavouring used extensively in Indian and Chines people. Curcumin is well-known for its therapeutic, nutraceutical, & dietary usage. As per Ayurveda, the indigenous Indian medical process, talc is used as alike multiple of goal.

Curcumin molecular targets on cancer cell

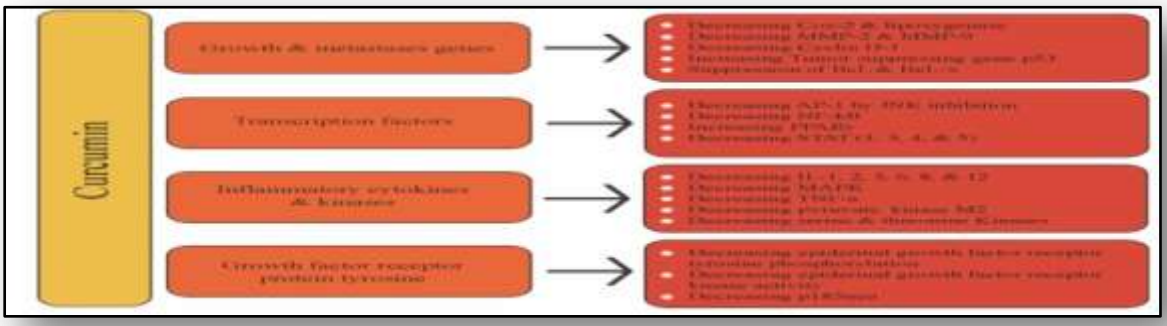

Figure:1 Molecular target cell

Physiochemical properties :-

1) Turmeric is 1,7-bis(4-hydroxy-3-methoxyphenyl)-1,6-heptadiene-3,5-dione, is a water repellent polyphenol.
2) This is a bright-yellow solid with a molar mass of 368 g/mol and a freezing point of 183 c
3) It is often used as a dye due to its bright curcumin can be living in various tautomeric forms
4) Aromatic ring is working with methoxy and hydroxyl groups in an ortho position with respect to one another

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Mechanism of action ofcurcumin biomedical application :-

Figure :2Curcumin

Anti-inflamatory action of nanocurcumin :-

The anti-inflammatory activity of curcumin complexes is reported because of the presence of 4-hydroxyphenyl unit which is further increased by the integration of acylation and alkylation or methoxy groups on the phenyl ring of curcumin. As an antiinflammatory, curcumin causes downregulation of NFkB, cyclooxygenase 2 (COX2) and pro-inflammatory cytokines such as interleukin-1 (IL-1 and IL-6) and TNF-α and showed high efficacy against rheumatoid arthritis, and post-operative inflammation [100]. Curcuminoid showed marked improvement in patients & was also develop to be safe and highly efficacious throughout the clinical trial.[1]

Anti-oxidant activity of nanocurcumin :-

The structure of talc contains a carbonyl, methoxy and hydroxyl groups pertaining to its antioxidant capacity due to its ability to scavenge free radicals in vivo, especially peroxyl radicals (ROO.). Albeit curcumin contains a β-diketone moiety which may subsist in a cis, Trans and enol form. Tonnesen et al reported that curcuminsubsits in the cis-enol form in solutions.[2]

Anti-microbial action of nanocurcumin :-

Due to the antimicrobial activities of indigeous talc, the investigation was expedited to get insight into the aspect of controlling bacterium. This polyphenol compound has shown a wide range of activity opposed various microorganisms like as Bacillus subtilis, Staphylococcus aureus, Pseudomonas aeruginosa, bacterium coli, Aspergillusniger, Penicilliumnotatum, Salmonella paratyphi, Mycobacterium tuberculosis and certain toxic yeast. Nanoformulation of turmeric have increase antibacterial power of activity than native talc that one is impute to its good wet-phase solvability & diffusion ability. Curcumin create membrane penetration is require in disrupting the 1, 2-dipalmitoyl-sn-glycero-3-phosphocholine (DPPC) membranes. [3]

Anti-cancer activity of nanocurcuimn :-

Curcumin has inspired great notice in the medicinal activity in clean oncology because of its chemo preventative, antitumor, radio sensibilizing and activities in resistence to different types of cancer cells. This spite in the breast,ovarian, prostate, lymphomas, multiple myeloma, brain cancer, melanoma and cancers. Talc moderate its anti-proliferative, anti-invasive and apoptotic effects on cancer cells along with many molecule action.[4]

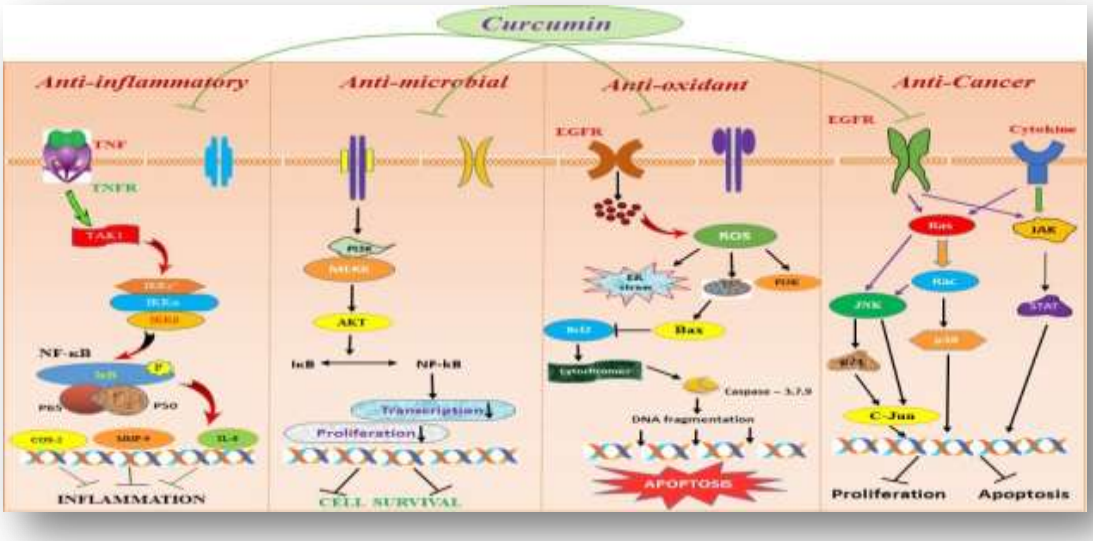

Figure: 3.Mechanism OfCurcuminNanoformulation

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Type Of Nanocarrier used in Curcumin Delivery:-

1) The peptides founded Encapsulation of turmeric For supply
2) Polysaccharides is Based on Encapsulation of Curcumin for supply
3) Self-Assembled Molecules and Ligands as messanger alike supplyofCurcumin

A) Metal-organic Framework
B) Covalent organic Framework

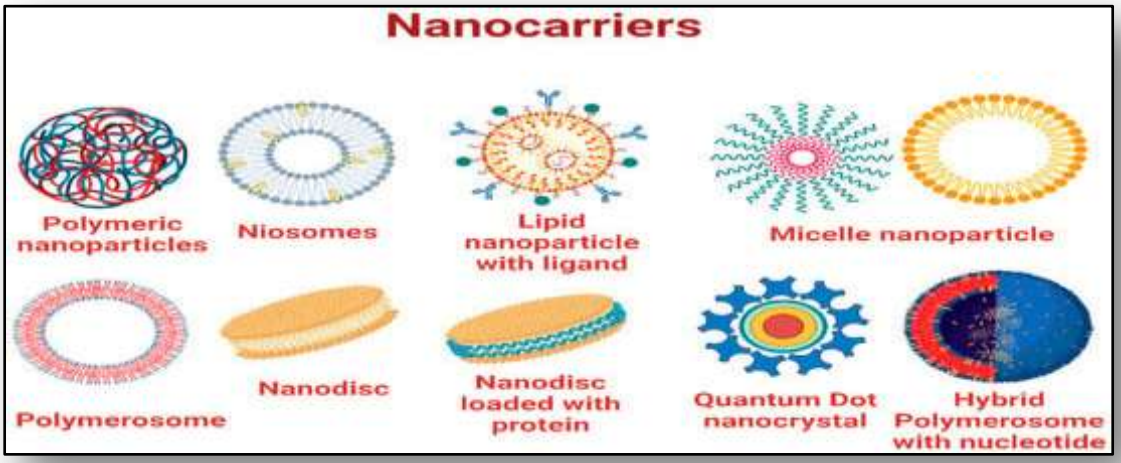

Figure: 4. Types of Curcumin Nanocarrier

Anticancer Activity of Curcumin against various type of Cancers :-

Curcumin keeps exhibited that excellent task in disrupting cancer cell developamdmultiplication in different cancers like as gastrointestinal, head and neck, brain, pancreatic, colorectal, breast, and prostate cancers. Some studies have already assessed his task in animal copy and human cell cultures. Furthermore, many serious studies carry also analyzed its safety & efficacy to cure some various types of cancer.

1) Oral Cavity and Salivary Gland Cancer

Curcumin has exhibited promising activities in preventing oral carcinogens. It has also been indicated that curcumin may play a role as an oral cavity chemopreventive factor because based on its capacity to suppressed activation of carcinogen via enhancing the expressions and actions of cytocrome P-450 1A1and CYP1B.[5]

2) Esophageal Cancer

The scalelikecell carcinoma and adenocarcinoma have the two main part of esophageal cancer. Generally the life quality of esophageal cancer patient remain poor beside exiting medicinal agent. Therefore, this is a necessity for innovative & in operational medicinal viewsfor esophageal cancer, even so small number of studies possess evaluated whether curcumin can be a potential candidate. Curcumin suppressed NF-kB action &stimulated programmed cell death in OE33 &Flo-1 adenocarcinoma cell lines & talc increased cisplatin and 5-fluorouracil-induced chemosensitity.[6]

3) Stomach Cancer

Infection of gastric epithelial cells caused by helicobacter pylori is a crucial mechanism in the case of gastric cancer growth. Curcumin was found to downregulate helicobacter pylori mediated AID expression by NF-kB pathway suppression. Then talc showed an in vitro & in vivo antimicrobial result aginst H. pylori & damageH. Pylori. hence, talc can be regarded as an resulted chemoprevenive factor opposed H. pylori mediated gastric carcinoma [7]

4) Intestinal Cancer

Anticancer activity of curcumin has been best described in intestinal cancers by utilizing in vivo animal models and cultured tumor cells. Curcumin has been found to be better tolerated and its pharmacologically active levels can be attained in colorectal tissues in individual following its oral administration [8].

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5) Hepatic Cancer

Fever individuals with hepatpocellular carcinoma are diagnosed at early stagesandtherapeuticoptions are highly inadequate. At present, surgery is considered as the most effective therapeutic strategy. Multiple experiment have evaluated in the vitro anti-carcinogenic activity of turmeric in hepatic cancer.

6) **Pancreatic Cancer**

Turmeric may own antitumor activity alone or in association along other therapeutic polymeric nanoparticle encapsulated turmeric existed administered systematically, it blocked metastasis and tumor develop in subcutaneous &orthotopic Pa03Cxenograft example of pancreatic cancer, while liposomal turmeric decrease tumor development in MiaPaCa-2 subcutaneous xenografts& in cultured pancreatic cancer cells [9]

7) Breast Cancer

Breast cancer is a big reason of expire in women. In BT-483 and cyclic D1 in MDC-MB-231 cells lines, the action of turmeric on NF-kB matrix metalloproteinases, and cell-cycle regulatory protein was also assessed [10]. Curcumin was reported to downregulate NF-kB, which further result in antiproliferative activity. Nonetheless, a reduction in CDK4 BT-483 and cyclic D1 in MDA-MB-231 cells was also noticed with curcumin treat.

8) Colorectal Cancer

Colorectal cancer is a very familier form of malignant cancer. In malignant colorectal cells, curcumin cure reduced the levels of MTG without altering the levels of COX-2 protein. Furthurmore administration of curcumindownregulated the miR-21 gene vis suppressing the binding of activator protein 1 with miR-21 promoter in HCT116 colorectal cancer cells, talc cure led to cell cycle capture in the G2/M phase via miR-21 gene regulation and suppressed the growth of tumor tissue [11].

9) Prostate Cancer

Curcumin has exhibited a powerful capacity to stimulate apoptosis and suppress proliferation in prostate cancer both in vitro and in vivo by affecting various cellular mediators including NF-kB, EGFR, and MAPK. In a study, curcumin was found to have the capacity to cause protein kinase D1 activation, which can lead to the weakening of the oncogenic signaling via MAPK and Beta catenin [12].

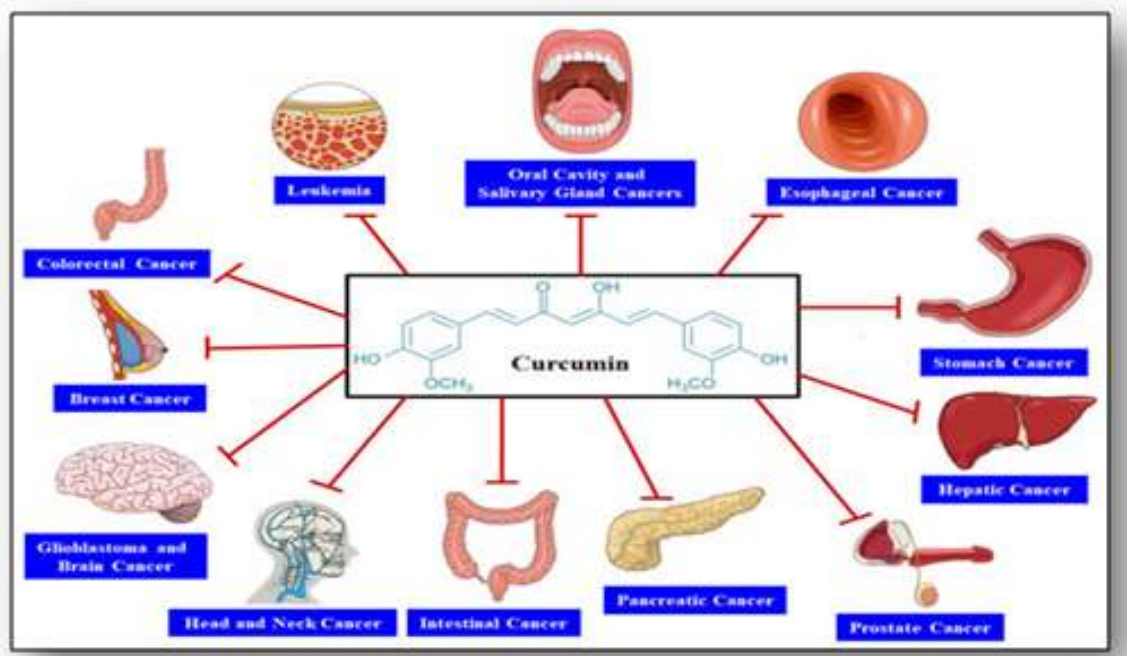

Figure: 5. Types of curcumin cancer

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Curcumin Nanoformulation Stratiges:-

In spite of proven effectiveness of some phytochemical in cancer therapy, there are major challenges limitimg their clinical utilizes. For example, curcumin has unfavourable properties of poor solubility in water, low physiochemical stability rapid intestinal and hepatic metabolism, genotoxicity and low cellular uptake, which can limit the therapeutic applications of its beneficial effects.[13].Several synthetic and natural delivery systems have been used for curcuminnanoencapsulation to internalize into cancer cells. Namely, An Update on Phytochemicals in Molecular Target Therapy of Cancer Current Medicinal Chemistry, 2016, Vol. 23, No. 42 9 Yang et al., achieved a controlled release system for curcumin using poly(lactic acid) (PLA), a biodegradable polyester, conjugating with curcumin molecules by the tris (hydroxymethyl) aminomethane (Tris) linker and using methoxypoly (ethylene glycol) (mPEG) for forming the corona of micelles Poly (lactic-coglycolic acid) (PLGA)-encapsulated curcumin nanoparticles in several reports, has been shown that facilitates cellular uptake in different cancer cell lines. PLGA-PEG-Fe3O4 has been effectively applied as an appropriate carrier for delivery hydrophobic phytochemicals such as silibinin to improve their action in inhibition of hTERT gene expression. Polyamidoamine (PAMAM) dendrimers encapsulating curcumin exhibited increased anti-proliferative effect on breast cancer cells than naked curcumin. In this study, TRAP assay showed that the effect of PAMAM encapsulating curcumin is considerably more than free curcumin. Phytochemicals encapsulation with cyclodextrin, a polysaccharide biodegradable polymer also has showed more effective effect than free phytochemicals in inhibition of telomerase expression in breast cancer in cell.[14].

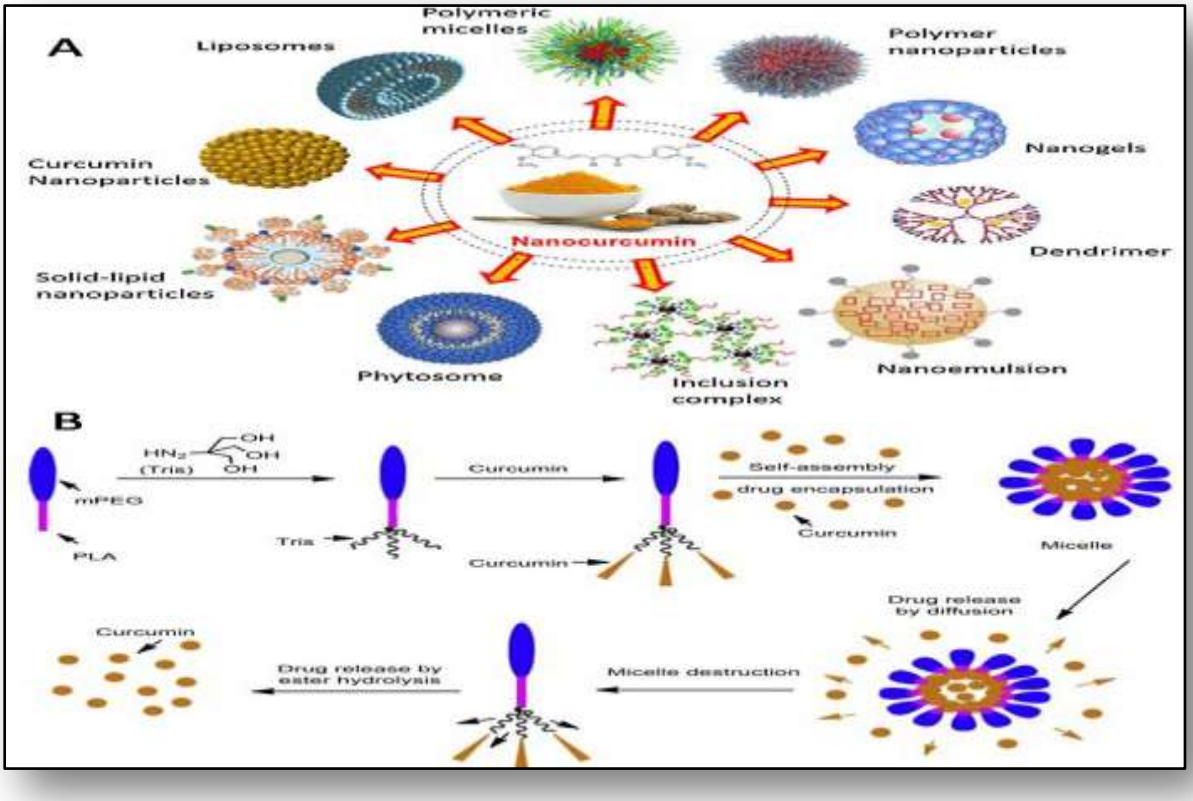

Figure: 6.Nanoformulation Stratiges

II. CONCLUSION :-

Curcumin display its capacity to emerge as a significant medicine for cancer. Curcumin having less solubility, higher metabolic action & less pharmacokinetic feature .turmeric has a very promising potential for its use in the cure of human diseases, especially cancer. Importantance of curcuminnanoformulation for breast, hepatic,

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oral,oesophagal,pancreatic,prostatae,instatinal,rectal,stomach,brain,head and neck cancer. Worldwide people suffering from these all type of cancer so one drug curcumin having all property to treat cancer targeted cell efficacy and safety.

REFERENCE :-

[1]. Satoskar RR, Shah SJ, Shenoy SG. Evaluation of antiinflammatory property of curcumin (diferuloyl methane) in patients with postoperative inflammation Int J ClinPharmacolTherToxicol. 1986; 24:651.

[2]. Tønnesen HH, Arrieta AF, Lerner D. Studies on curcumin and curcuminoids. XXIV: Characterization of the spectroscopic properties of the naturally occurring curcuminoids and selected derivatives. Pharmazie. 1995; 50:689–93.

[3]. Lüer S, Troller R, Aebi C. Antibacterial and antiinflammatory kinetics of curcumin as a potential antimucositis agent in cancer patients. Nutr Cancer. 2012; 64:975–81.

[4]. Singh AK, Sharma N, Ghosh M, Park YH, Jeong DK. Emerging importance of dietary phytochemicals in fight against cancer: role in targeting cancer stem cells. rit Rev Food SciNutr. 2017; 57:3449–3463.

[5]. Rinaldi, A.L.; Morse, M.A.; Fields, H.W.; Rothas, D.A.; Pei, P.; Rodrigo, K.A.; Renner, R.J.; Mallery, S.R. Curcumin activates the aryl hydrocarbon receptor yet significantly inhibits (-)-benzo(a)pyrene-7R-trans-7,8-dihydrodiol bioactivation in oral squamous cell carcinoma cells and oral mucosa. Cancer Res. 2002, 62, 5451–5456. [Google Scholar] [PubMed]

[6]. Hartojo, W.; Silvers, A.L.; Thomas, D.G.; Seder, C.W.; Lin, L.; Rao, H.; Wang, Z.; Greenson, J.K.; Giordano, T.J.; Orringer, M.B.; et al. Curcumin promotes apoptosis, increases chemosensitivity, and inhibits nuclear factor κB in esophageal adenocarcinoma. Transl. Oncol. 2010, 3, 99–108. [Google Scholar] [CrossRef] [Green Version]

[7]. Münzenmaier, A.; Lange, C.; Glocker, E.; Covacci, A.; Moran, A.; Bereswill, S.; Baeuerle, P.A.; Kist, M.; Pahl, H.L. A secreted/shed product of Helicobacter pylori activates transcription factor nuclear factor-kappa B. J. Immunol. 1997, 159, 159. [Google Scholar]

[8]. Sharma, R.A.; Steward, W.P.; Gescher, A.J. Pharmacokinetics and pharmacodynamics of curcumin. Adv. Exp. Med. Biol. 2007, 595, 453–470. [Google Scholar] [PubMed] [Green Version

[9]. Li, L.; Braiteh, F.S.; Kurzrock, R. Liposome-encapsulated curcumin: In vitro and in vivo effects on proliferation, apoptosis, signaling, and angiogenesis. Cancer 2005, 104, 1322–1331. [Google Scholar] [CrossRef] [PubMed]

[10]. Bayet-Robert, M.; Kwiatkowski, F.; Leheurteur, M.; Gachon, F.; Planchat, E.; Abrial, C.; Mouret-Reynier, M.A.; Durando, X.; Barthomeuf, C.; Chollet, P. Phase I dose escalation trial of docetaxel plus curcumin in patients with advanced and metastatic breast cancer. Cancer Biol. Ther. 2010, 9, 9. [Google Scholar] [CrossRef] [Green Version]

[11]. Mudduluru, G.; George-William, J.N.; Muppala, S.; Asangani, I.A.; Kumarswamy, R.; Nelson, L.D.; Allgayer, H. Curcumin regulates miR-21 expression and inhibits invasion and metastasis in colorectal cancer. Biosci. Rep. 2011, 31, 185–197. [Google Scholar] [CrossRef] [Green Version]

[12]. Sundram, V.; Chauhan, S.C.; Jaggi, M. Emerging roles of protein kinase D1 in cancer. Mol. Cancer Res. 2011, 9, 985–996. [Google Scholar] [CrossRef] [PubMed] [Green Version]

[13]. Siddiqui, I.A.; Sanna, V.; Ahmad, N.; Sechi, M.; Mukhtar, H. Resveratrol nanoformulation for cancer prevention and therapy. Ann. N.Y. Acad. Sci., 2015, 1348(1), 20-31. [http://dx.doi.org/10.1111/nyas.12811] [PMID: 26109073]

[14]. Mollazade, M.; Nejati-Koshki, K.; Akbarzadeh, A.; Zarghami, N.; Nasiri, M.; Jahanban-Esfahlan, R.; Alibakhshi, A. PAMAM dendrimers augment inhibitory effects of curcumin on cancer cell proliferation: possible inhibition of telomerase. Asian Pac. J. Cancer Prev., 2013, 14(11), 6925-6928. [http://dx.doi.org/10.7314/APJCP.2013.14.11.6925] [PMID: 24377627].