

BAB 5

KESIMPULAN DAN SARAN

5.1. Simpulan

Berdasarkan hasil penelitian, formulasi masker wajah gel *peel-off* ekstrak kental epikarpium buah semangka (*Citrullus lanatus*) dengan kombinasi PVA sebagai *film forming agent* dapat meningkatkan respon nilai viskositas, menurunkan daya sebar dan memperlama waktu mengering sediaan. Faktor gliserin sebagai plastisiser dapat meningkatkan nilai viskositas, menurunkan daya sebar dan mempercepat waktu mengering sediaan. Interaksi keduanya dapat meningkatkan respon terhadap nilai viskositas, menurunkan daya sebar dan memperlama waktu mengering sediaan masker wajah gel *peel-off* ekstrak kental epikarpium semangka (*Citrullus lanatus*).

Hasil optimasi memberikan formula optimum pada masker gel *peel-off* ekstrak kental epikarpium buah semangka (*Citrullus lanatus*) yang diperoleh dengan *design expert* yaitu kombinasi PVA 11,143% dan Gliserin 6,443% dengan perkiraan hasil viskositas 21.419,926 cPs, daya sebar 6,642 cm dan waktu kering 20,535 menit.

5.2. Saran

Perlu dilakukan pengembangan metode evaluasi terukur menggunakan alat pada efektivitas kekencangan, elastisitas dan kemudahan dilepaskan sehingga hasil yang diperoleh lebih valid.

DAFTAR PUSTAKA

- Anggraini, D., Malik, M. dan Susiladewi, M., 2011, 'Formulasi Krim Serbuk Getah Buah Papaya (*Carica papaya* L.) sebagai Anti Jerawat', Prosiding Seminar Nasional. *Peranan dan Kontribusi Herbal dalam Terapi Penyakit Degeneratif*, Semarang, Indonesia, pp.42-47.
- Anonim, 2013, *Safety Assessment of Polyvinyl Alcohol as Used in Cosmetics*, Cosmetic Ingredient Review, Washington DC.
- Ansel, H.C., 1985, *Pengantar Bentuk Sediaan Farmasi*, Diterjemahkan dari Bahasa Inggris oleh Farida Ibrahim, UI Press, Jakarta.
- Astuti, Y.I., Hartanti, D., Aminiati, A., 2010, Peningkatan Aktivitas Anti Jamur *Candida Albicans* Salep Minyak Atsiri Daun Sirih (*Piper betle* LINN.) Melalui Pembentukan kompleks Inklusi dengan β -Siklodekstrin, *Majalah Obat Tradisional*, **15**(3), 94-99.
- Aswal, A. Karla, M. and Rout, A., 2013, Preparation and Evaluation of Polyherbal Cosmetic Cream, *Der Pharmacia Lettre*, **5**(1):83-88.
- Badan Pengawas Obat dan Makanan Republik Indonesia (BPOM RI), 2011, *Peraturan Kepala Badan Pengawas Obat dan Makanan no. Hk.03.1.23.12.11.10052 tahun 2011 tentang Pengawasan Produksi dan Peredaran Kosmetika*, Jakarta.
- Badan Pengawas Obat dan Makanan Republik Indonesia, 2013, *Persyaratan teknis kosmetika* Buku 3, Jakarta: Badan Pengawas Obat dan Makanan.
- Balsam, M. S. and Sagarin, E., 1974, *Cosmetic Science and Technology*, 2nd ed, Wiley-Interscience, New York, **1**, pp. 307-315.
- Barel, A.O., Paye, M., and Maibach, H. I., 2009, *Handbook of Cosmetic Science and Technology*, 3 Ed., New York: Informa Healthcare USA, Inc. pp. 233, 261-262.
- Barnard, C., 2011, *Investigating the Effect of Various Film-Forming Polymers on the Evaporation Rate of a Volatile Component in Cosmetics Formulation*, *Disertasi*, Nelson Mandela Metropolitan University.
- Barus, A. dan Syukri, 2008, *Agroteknologi Tanaman Buah-buahan*, USU Press, Medan.
- Becker, L., 2014, *Safety Assessment of Glycerin as Used in Cosmetics*, Cosmetic Ingredient Review, Washington DC.

- Berhings, A.O., Rosa, J.M., Stulzer, H.K., Budal, R.M., Sonaglio, D., 2013, Green Clay and Aloe Vera Peel-Off Facial Masks: Response Surface Methodology Applied to the Formulation Design, *American Association of Pharmaceutical Scientists Pharm Sci Tech*, **14(1)**: 445-455.
- Bertuzzi, M.A., Gottifredi, J.C. and Armada, M., 2012, Mechanical Properties of a High Amylose Content Corn Starch Based Film, Gelatinized at Low Temperature, *Brazilian Journal of Food Technology*, Campinas, Argentina, **15(3)**: 219-227.
- Bolton, S and Bon, C., 2004, *Pharmaceutical Statistic Pratical and Clinical Application* Four Edition, Marcel Dekker, Inc., New York.
- Bomberdelli, E., 1991, Technologies for the Processing of Medicinal Plants, in R. O. B. Wijesekera (ed.), *The Medicinal Plant Industry*, C R C Press Inc., Florida.
- Brouk, B., 1975, Plants Consumed by Man, *Academic Press*, London, New York, San Fransisco.
- Buang, A., 2013, Formulasi Krim Masker Wajah Menggunakan Lapisan Putih Kulit Semangka (*Citrullus vulgaris Schard*) sebagai Pelembab, *Media Farmasi*, **11(18)**: 37-42.
- Budiman, M.H., 2008, 'Uji Stabilitas fisik dan aktivitas antioksidan sediaan krim yang mengandung ekstrak kering tomat', *Skripsi*, Sarjana Farmasi, Universitas Indonesia, Jakarta.
- Buhse, L., Kolinski, R., Westenberger, B., Wokovich, A., Spencer, J., Chen, C.W., Turujman, S., Basak, M.G., Kang, G.J., Kibbe, A., Heintzelmen, B., and Wolfgang, E., 2005, Topical Drug Classification, *International Journal of Pharmaceutics*, **295**: 101-112.
- Chan, L.W., Hao, J.S., and Heng, W.S., 1999, Evaluation of Permeability and Mechanical Properties of Composite Polyvinyl Alcohol Films, *Chemical and Pharmaceutical Bulletin*, **47(10)**: 1412-1416.
- Cui-Ping, W., 2011, Studies on Antioxidant and Anticancer Activities of Seedling Watermelon, *J.Anhui Agric Sciences*, **S651**: 29-31.
- Curis, E., Nicolis, I., Mionard, C., and Naima, Z., 2005, Almost all about citrulline in mammals, Diakses pada 23 Agustus 2016, <https://www.researchgate.net/publication/7676607>
- Dalimartha, 2003, *Atlas Tumbuhan Obat Indonesia* Jilid 3, Puspa Swara, Jakarta.

- Departemen Kesehatan RI, 1985, *Formularium Kosmetika Indonesia*, edisi I, Departemen Kesehatan Republik Indonesia, Jakarta.
- Departemen Kesehatan RI, 1995, *Farmakope Indonesia* Edisi IV, Departemen Kesehatan Republik Indonesia, Jakarta.
- Departemen Kesehatan RI, 2011, *Suplemen II Farmakope Herbal Indonesia*, Edisi I, Departemen Kesehatan Republik Indonesia, Jakarta.
- Ditjen POM RI, 2000, *Parameter Standar Umum Ekstrak Tumbuhan Obat*, Departemen Kesehatan Republik Indonesia, Jakarta.
- Edwards, A.J., Vinyard B.T., Wiley E.R., Brown E.D., Collins J.K., Perkins-Veazie P., Baker R.A. and Clevidence B.A., 2003, Human nutrition and metabolism: consumption of watermelon juice increases plasma concentrations of lycopene and beta-carotene in humans, *The Journal of Nutrition*, **133**: 1043-1050.
- Food and Drug Administration (FDA), 1999, *Sunscreen Drug Product for Over the Counter Human Use*, an Update, U.S. Department of Health and Human Service.
- Funk, J.O. and Maibach, H.I. 1994, Horizons in pharmacologic intervention in allergic contact dermatitis, *J. Am. Acad. Dermatol.*, **31**: 999-1014.
- Gandjar, I.G., dan Rohman, A., 2013, *Kimia Farmasi Analisis*, Pustaka Pelajar, Yogyakarta.
- Garg, A., Aggarwal, D., Garg, S., and Sigla, A.K., 2002, Spreading of Semisolid Formulation: An Update, *Pharmaceutical Tecnology*. Diakses pada tanggal 12 Agustus 2016, http://images.alfresco.advanstar.com/alfresco_images/pharma/2014/08/22/c0e3f115-2d30-47c3-8a80-c478037fd1cf/article-30365.pdf
- Gaudin, S., Lourdin D., Le Botlan, D., Ilari, J.L., and Colonna, P., 1999, Plasticization and Mobility in Starch-Sorbitol Films, *Jurnal of Cereal Science* **29(3)**: 273-284.
- Harmita, 2014, *Analisis Fisika kimia* Vol.2, Penerbit Buku Kedokteran EGC, Jakarta.
- Hassan, C.M. and Peppas, N.A., 2000, Structure and Applications of Poly (vinyl alcohol) Hydrogels Produced by Conventional Crosslinking or by Freezing/Thawing Methods, *Advance in Polymer Science.*, **153**: 37-65.

- Ismayanti, Bahri S., Nurhaeni, 2013, Kajian kadar fenolat dan aktivitas antioksidan jus kulit buah semangka (*Citrullus lanatus*), *Online Journal of Natural Science*, **2(2)**: 36-45.
- Jones, D.S. 2010, *StatistikFarmasi*, diterjemahkan dari Bahasa Inggris oleh H. U. Ramadaniati dan H. H. Rivai, N. Aini (ed.), Penerbit Buku Kedokteran EGC, Jakarta.
- Juan P. C., Veronica L.MD., Bertha T.A., and Benjamin M.MD. 2003. A Simple Measure For Applying Sunscreen While On Holidays, *Dermatology Online Journal* **9(3)**: 23.
- Junqueira, L.C. and Kelly, O. R., 1997, *HistologiDasar*, diterjemahkan dari bahasa Inggris oleh Jan Tamboyang, EGC, Jakarta.
- Kartasubrata, Y., 1987, *Dasar-Dasar Kromatografi*, Makalah pada Kursus Metode Analisis Instrumental, Pusat Penelitian dan Pengembangan Kimia Terapan, Lembaga Ilmu Pengetahuan Indonesia, Bandung.
- Kartika B., Hastuti, P. dan Supartono, W. 1988, *Panel dalam Pedoman Uji Inderawi Bahan Pangan*, Proyek Peningkatan/Pengembangan Perguruan Tinggi Universitas Gadjah Mada Yogyakarta, Yogyakarta, pp 22-47.
- Krishna, N. and Brow, F., 1964, Polyvinyl Alcohol as an Ophthalmic Vehicle: Effect on Regeneration of Corneal Epithelium, *Am. J. Ophthalmol*, **57**: 99-106.
- Kurniawan, D. W. DanSulaiman S. T. N., 2009, *Teknologi Sediaan Farmasi*, Graha Ilmu Yogyakarta, pp 703-704, 738-787.
- Lachman, L., Herbert, L.A., and Joseph, K.L., 1989, *The Theory and Practice of industrial Pharmacy* diterjemahkan dalam bahasa Indonesia Oleh Siti Suyatmi, UI Press, Jakarta.
- Lestari, P. M., Sustyasningsih, R. B. Dan Ruhimat, 2013, The Influence of Increase Concentration Polivinil Alkohol (PVA) as a Gelling Agent 112 on Physical Properties of the Peel-Off Gel of Pineapple Juice (*AnanascomosusL.*), *Asian Societies of Cosmetic Scientists Conference*, p127.
- List, P. H. and Schmidt, P. C., 1989, *Phytopharmaceutical Technology*, Son Limited, London.
- Liu, W., Zhao, S., Cheng, Z., Wan, X., and Yan, Z., 2010, Lycopene and citrullin contents in watermelon (*Citrulluslanatus*) fruit with different ploidy and changes during fruit developmeent, *Zhengzhou Fruit Research Institute*, China.

- Madey, D. L. and Pinnell, S. R., 2001, Using topical antioxidants to protect against photodamage and improve skin care, *Operative Techniques in Oculoplastic, Orbital and Reconstructive Surgery*, **4(2)**:62-64.
- Martin, A. N., Swarbick, J. and Cammarata, A., 1993, *Physical Pharmacy*, 2nd edition, Lea & Febiger Publisher, London.
- Mawarni, A.N dan Fithriyah, N.H., 2015, 'Pengaruh Konsentrasi Starter Terhadap Kadar Asam Laktat Dalam Pembuatan Fruitghurt Dari Kulit Buah Semangka', *Seminar Nasional Sains dan Teknologi Fakultas Teknik Universitas Muhammadiyah 17 November 2015*, Jakarta.
- Misha, S., Mat, S., Ruslan, M.H., Sopian, K., and Saleh, E., 2013, Review on the Application of Tray Dryer System for Agricultural products, *World Applied Science Journal*, **22(3)**, 424-433.
- Mitsui, T., 1997, *New Cosmetic Science*, Amsterdam, Elsevier Science B. V., The Netherlands.
- Mohammed, A.I. and Al-Bayati, M.A., 2014, Comparative study among watermelon crud extract, citrulline and lycopene on some reproductive indices in male mice, *International Journal of Research In Medical and Health Sciences*, **3(6)**: 7-14.
- Nahar, K., 2012., 'Phytochemical and biological investigation of the rind of *Citrullus lanatus* available in Bangladesh', *Thesis*, Degree of B.Pharm, East West University, Bangladesh.
- Nawanopparatsakul, S., Euasathien, J., Eamtawecharum, C., Benjasirimingkol, P., Soiputtan, S. and Pacchamud, P. T., 2005, Skin Irritation Test of Curcuminoids Facial Masks Containing Chitosan as a Binder, *Silpakorn University International Journal*, **5(1-2)**:140-147.
- Nawar, W. F. 1996, 'Lipids' in: Fennema, O. (ed.), *Food chemistry*, 3rd ed., Marcel Dekker, Inc., New York, pp. 225–320.
- Ngoenkratok, J., Worachuen, P., Puapermpoonsiri, W., and Silaon, W., 2011, The Influence of Ethanol Content on Physical Characteristic and Mechanical Properties of Facial Peel Off Mask Contained the Ethanolic Extract of *Centellaasiatica* (Linn.) Urban, *Isan Journal of Pharmaceutical Science* **(11)**:7-12.
- Nurrohmach, B., 2012, 'Optimasi Filming Agent Polivinil Alkohol dan Humektan Gliserin dalam Formula Gel Masker Peel Off Antiacne Ekstrak Daun Kemangi (*Ocimum sanctum* L.) Aplikasi dengan Desain Faktorial', *Skripsi*, Fakultas Farmasi, Universitas Sanata Dharma, Yogyakarta.

- Ogur, E., 2005, *Polyvinyl Alcohol: Material, Processing and Applications*, Smithers Rapra Technology, United Kingdom.
- Olabinri, B., Olaleye, M., Ajani, R., Akinmayowa, S., Busayo, O. and Funmilola, A., 2013, In vitro discovery of watermelon (*Citrullus lanatus*) extract with moderate chelating ability, and survey of other in vitro bioactivities, *American International Journal of Contemporary Research*, **3(4)**:3-6.
- Oliveira, W.P., Bott, R.F., Labuza, T.P., 2010, Stability Testing of Spray-and Spouted Bed-Dried Extract of Passifloraalata, *Drying Technology: An Internasional Journal*, **(28)**:1255-1265.
- Park, J.H., Kyong, K.Y., Kwak, T.J., Yoon, M.S., Kang, S.H., 1999, Effect of Plasticizers on The Properties of Cosmetic Mask Using Polyvinyl Alcohol (PVA) as A Film Former, *Cosmetics R&D Center*, LG Chem., Taejon, Korea.
- Paton, T.F. and Robinson, J. R., 1975, Ocular Evaluation of Polyvinyl Alcohol Vehicle in Rabbits, *J. Pharm. Sci.*, **64**:1312-16.
- Pena, L. E., 1990, Gel Dossage Forms: Theory, Formulation, and Processing, in Osborne, D. W. and A. H. Amann, *Topical Drug Delivery Formulations*, Marcel Dekker Inc., New York, pp381-88.
- Percival, M., 1998, Antioxidants, *Clinical Nutrition Insights*, Advanced Nutrition Publication Inc.
- Pita, A.K.N. 2007, 'Pengaruh Konsentrasi Asam Sitrat dan Konsentrasi dan Konsentrasi Karaginan terhadap Kualitas Jelly Kulit Semangka (*Citrullus vulgaris*, Schard)', *Skripsi*, Program Studi Pendidikan Matematika dan IPA Fakultas Keguruan Ilmu Pendidikan, Universitas Muhammadiyah Malang, Malang.
- Poljsak, B., and Dahmane R., 2012, *Review Article* : Free Radicals and Extrinsic Skin Aging. *Dermatology Research and Practice* , Hindawa Publishing Corporation.
- Puspita, A., Widayanti, A., Sutyasningsih, 2013, Optimasi Penggunaan polivinil alcohol sebagai Gelling Agent pada Masker gel *Peel-Off* Sari Daging Kulit BuahSemangka (*Citrullus vulgaris* (Thumb), Maksum dan Nakai), *Karya Tulis Ilmiah*, Fakultas Farmasi dan Sains Universitas Muhammadiyah Prof. DR. Hamka, pp.1-12.
- Pu-you, Ji., Cai-ying, B., Li-Hong, H.,Yong-hong, Z., 2014, Properties of Poly(vinyl alcohol) Plasticized by Glycerin, *Journal of ForestProducts and Industries*, Research Publisher, China.

- Rahman, B. 2013, 'Phytochemical Investigation of *Citrulluslanatus*(Watermelon Rind)', *Thesis*, Degree of Bachelor of Pharmacy, East West University, Bangladesh.
- Rahmawanty, D., Nita, Y., dan Mia, F., 2015, *Formulasi dan Evaluasi Masker Wajah Peel-Off Mengandung Kuersetin Dengan Variasi Konsentrasi Gelatin dan Gliserin*, *Media Farmasi*, **12 (1)**: 17-32.
- Ratu, A.P., Silabi, N.F., dan Citreksoko, P., 2016, Uji Antioksidan Ekstrak Pigmen Karotenoid dan Sitrulin Pada Kulit Buah Blewah (*Cucumis Melo*L.) Secara *In Vitro* (Metode DPPH), *Jurnal Farmamedika*, **1(1)**:1-12.
- Reed, T., Barret, A.H., Briggs, J., and Richardson, M., 1998, Texture and Storage Stability of Processed Beefstick as Affected by Glycerol and Moisture Level, *Journal Food Science* **63**: 84-87.
- Rieger, M. M., 2000, *Harry's Cosmeticology*, 8th ed., Chemical Publishing Co, Inc., New York.
- Rimando, A.M., and Perkins P .V., 2005, Determination of citrulline in watermelon rind, *Journal of Chromatography*, 1078:196-200.
- Rochmatica, D. L., Kusumastuti, H., Muslinah, I. N., Setyaningum, D.G., 2012, Analisis Kadar Antioksidan pada Masker Wajah Berbahan Dasar Lapisan Putih Kulit Semangka (*Citrullus vulgaris* Schard), *Skripsi*, Fakultas Matematika dan Ilmu Pengetahuan Alam, Universitas Negeri Yogyakarta.
- Rowe, R.C., Sheskey, P.,J., and Owen, S.C., 2009, *Handbook of Pharmaceutical Excipients 6th*, Pharmaceutical Press, American Pharmaceutical Association, New York, Sciences, **45(3)**:515-525.
- Rukmana, R., 1994, *Budidaya Semangka Hibrida*, Kanisius, Yogyakarta.
- Santanu, R., Hussan, S.D., Rajesh, G., Daljit, M., 2012, A Review On Pharmaceutical Gel, *International Journal of Pharmaceutical Research and Bio-Science* **1(5)**: 21-36.
- Sarker, S.D., Latif, Z. and Gray, A.I., 2006, *Natural Products Isolation*, 2nd ed., Humana Press, Totowa, pp. 77-80, 83-90.
- Septiani, S., Wathoni, N. Dan Mita, S. R., 2012, Formulasi Sediaan Masker Gel Antioksidan dari Ekstrak Etanol Biji Melinjo, *Jurnal Penelitian*, Fakultas Farmasi Universitas Padjajaran, pp. 1-26.
- Shakhashiri, 2009, *Ethanol*, Chemical of the Week, Diakses pada tanggal 22 Agustus 2016, <http://www.scifun.org/chemweek/pdf/ethanol.pdf>.

- Sharma, O.P., 1993, *Plant Taxonomy*, Tata McGraw Hill Publishing Company Limited, New Delhi.
- Sherma, J. and Fried, B., 2003, *Handbook of Thin-Layer Chromatography*, 3rd ed., Marcel Dekker Inc., New York, pp.1-2.
- Sherwood, L., 2009, *Fisiologi Manusia dari Sel ke Sistem* Edisi 6, Penerbit Buku Kedokteran EGC, Jakarta.
- Soap and Detergent Association (SDA), 1990, *Glycerine: an Overview*, Glycerine and Oleochemical Division, 475 Park Avenue South, New York.
- Tranggono, R.I., danLatifah, F., 2007, *Buku Pegangan Ilmu Kosmetik*, PT. Gramedia Pustaka Utama, Jakarta.
- Tresna, P., 2010, *Perawatan Kulit Wajah (Facial)*, Universitas Pendidikan Indonesia, Bandung.
- Tubbs, R. K., 1966, Sequence Distribution of Partially Hydrolyzed Poly(vinyl acetate), *J. Polym. Sci.*, **(4)**:623-29.
- Vieira, M.G.A., Altenhofen, M., da Silva., Oliveira, L., dos Santos., Beppu, M.M., 2011, Natural-Based Plasticizers and Biopolymers Films : A Review, *European Polymer Journal* **47**: 254-263.
- Vieira, R.P., Fernandes, A. R., Kaneko, T. M., Consiglieri, V. O., Pinto, C.A. S., Pereira, C. S. C., Baby, A. R. and Velasco, M. V. R., 2009, Physical and Physicochemical Stability Evaluation of Cosmetic Formulations Containing Soybean Extract Fermented by *Bifidobacterium animalis*, *Brazilian Journal of Pharmaceutical Sciences*, **45(3)**:515-525.
- Voigt, R., 1994, *Buku Pelajaran Teknologi Farmasi* edisi 5, Terjemahan Soewandhi, S.N., Penerbit Gadjah Mada University Press, Yogyakarta.
- Voigt, R., 1995, *Buku Pelajaran Teknologi Farmasi* edisi 5, Terjemahan Soewandhi, S.N, Gadjah Mada University Press, Yogyakarta.
- Wan, L. S. C. and Lim, L. Y., 1992, Drug Release from Heat Treated Polyvinyl Alcohol Films, *Drug Dev. Ind. Pharm.*, **18**:1895-1906.
- Ward, J. B. and Sperandio, G. J., 1964, Cosmetic Applications of PolyvinylAlcohol, *J. Soc. Cos. Chem.*, pp 327-335, Boston.
- Wasitaatmadja, S.M., 1997, *Penuntun Ilmu Kosmetik Medik*, UI press, Jakarta.
- We Leung, W. T., Butrum, R. R. dan Chang, F. H., 1970, *Food Composition Table For Use In Asia Part I*, US Department of Health Education and Welfare Bethesda and FAO, Rome.

- Widyaningrum, H., 2011, *Kitab Tanaman Obat Nusantara*, Media Pressindo, Yogyakarta.
- Wihardjo, F., A., S., 1993, *Bertanam Semangka*, Kanisius, Yogyakarta.
- Wilkinson, J.B., and Moore, R.J., 1982, *Harry's Cosmetology: The Principle of Modern Cosmetic 6th* Editor, Leonard Hill Book, London.
- Windono, T., Soediman, S., Yudawati, U., Ermawati, E., Srielita, Erowati, T. I., 200, Uji Peredam Radikal Bebas terhadap 1,1-Diphenyl-2-Picrylhydrazyl (DPPH) dari Ekstrak Kulit Buah dan Biji Anggur (*Vitis vinifera* L.) Probolinggo Biru dan Bali, *Artocarpus*, Surabaya **1(1)**: 34-43.
- Wlascheck, M., Tantcheva-Poor, I., Naderi, L., Ma, W., Alexander, S., Razi-Wolf, Z., Shuller, J., Scharffetter-Kochanek, K., 2001, Solar UV irradiation and dermal photoaging, *Journal of Photochemistry and Photobiology B*, **63**: 41-51.
- Wypych, G., 2013, *Handbook of Plasticizers 2nd* edition, penerbit William Andrew.
- Yadla, A. K., Baig, M.S., Sandhya, M., Aishwarya, Alekhya, Nirmala, Teja, R. and Venkatesh., 2013, Development of Watermelon rind incorporated fruit butter, *International Journal of Engineering Research and Technology (IJERT)*, **2(10)**: 70-75.
- Yamauchi, M., Woodley, D.T, Mechanic, G.L., 1988, Aging and Cross-linking of Skin Collagen, *BiochemBiophys Res Commun*, **152**: 898-903.