

# पर्यावरण प्रदूषण, पर्यावरण अवनयन की अंतिम सीमा : एक अध्ययन

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सारांश -

मनुष्य के क्रियाकलापों द्वारा पर्यावरण के संघटकों की आधारभूत संरचना में प्रतिकूल परिवर्तनों के कारण पर्यावरण की गुणवत्ता में इस सीमा तक ह्रास होना कि इन प्रतिकूल परिवर्तनों का जैविक समुदाय तथा मानव समाज पर गहरा प्रतिकूल प्रभाव पड़ने लगता है पर्यावरण अवनयन कहलाता है, पर्यावरण अवनयन के कारण पारिस्थितिक तंत्र एवं पारिस्थितिकी की विविधता में कमी होने से पारिस्थितिकीय एवं पर्यावरणीय असंतुलन उत्पन्न हो जाता है। बढ़ते औद्योगीकरण और आधुनिक जीवन-शैली के चलते पूरी धरती का संतुलन बिगड़ रहा है। प्रदूषण आज पूरी पृथ्वी के लिए एक बड़ी समस्या बन चुका है। दुनिया के तमाम देश प्रदूषण की समस्या से जूझ रहे हैं। मानवीय गतिविधियों और तकनीकी उपकरणों के अत्याधिक उपयोग के कारण आजकल वायु अत्याधिक प्रदूषित हो गई है। पिछली डेढ़ सदी में हमने तरक्की कि जो मिसाल कायम की है, वह सब कुछ पर्यावरण की कुर्बानी देकर हासिल हुआ है। नतीजा सामने है, हवा, पानी, ज़मीन और जंगल को लेकर हर कहीं चिंता पैदा हो गई है। हालांकि आबोहवा में तब्दीली हमें महसूस तो पचास साल पहले ही होने लगी थी, लेकिन उसे लगातार नजर अंदाज करने का नतीजा यह है कि धरती खतरनाक स्थिति में पहुँच चुकी है। गर्मी, बारिश, सूखा, बाढ़, ठंड के बेवक्त और जबरदस्त प्रकोप से डगमगाए संतुलन ने घबराहट पैदा कर दी है। अब जब थोड़ा चेतने हैं, तो रस्म अदायगी के सम्मेलनों की बाढ़ सी आ गई है। मगर जो हाल है और जैसा चल रहा है अगर वैसा ही चलता रहा तो जलवायु परिवर्तन पर होने वाले तमाम सम्मेलन और दूसरी गतिविधियाँ कहीं महज उत्सव बन कर न रह जाएँ।

मुख्य शब्द - पर्यावरण, प्रदूषण, प्राकृतिक संसाधन, प्रौद्योगिकीय।

पर्यावरणीय समस्याओं एवं पर्यावरण अवनयन के कारण - पर्यावरण अवनयन तथा उससे जनित विश्वव्यापी पर्यावरणीय संकट का सर्वप्रथम कारण है मनुष्य तथा प्राकृतिक पर्यावरण के बीच तेजी से बिगड़ता संबंध। वास्तव में प्राकृतिक संसाधनों के तेजी से विदोहन, प्रौद्योगिकीय प्रगति एवं औद्योगिक एवं नगरीय विस्तार के कारण प्राकृतिक पर्यावरण एवं उसके पारिस्थितिकीय स्वरूप पर दूरगामी प्रतिकूल प्रभाव पड़े हैं।

मनुष्य के कार्यों द्वारा पर्यावरण में तेजी से हो रहे परिवर्तनों तथा उनसे जनित पर्यावरण अवनयन के भयावह रूप को देखते हुए R.F. Dasmann (1976) ने कहा है, कि "मानव दीड़ हाथ में ग्रेनेड लिए बन्दर के समान है। कोई यह नहीं जानता कि वह कब ग्रेनेड से पिन खींच लेगा तथा विश्व तहस-नहस हो जायेगा।" J. Poelmans - Kirschen (1974) ने पर्यावरण अवनयन तथा उससे उत्पन्न विश्वस्तरीय पर्यावरण संकट के लिए निम्न कारणों का अभिनिर्धारण किया है :

1. उत्पादन विभव में तेजी से वृद्धि।
2. वैज्ञानिक एवं प्रौद्योगिकीय खोज तथा विकास में तीव्र वृद्धि।
3. विश्व जनसंख्या में गुणोत्तर वृद्धि।

सामान्य तौर पर पर्यावरण अवनयन तथा उससे जनित पर्यावरणीय समस्याओं एवं पर्यावरण संकट के निम्न कारण है :

- ⇒ मानव जनसंख्या में गुणोत्तर वृद्धि,
- ⇒ तीव्र गति से वैज्ञानिक एवं प्रौद्योगिकीय विकास,
- ⇒ तीव्र गति से विकास के लिए महत्वाकांक्षी विकासीय योजनाओं एवं कार्यक्रमों का नियमन एवं क्रियान्वयन,
- ⇒ औद्योगीकरण, नगरीकरण एवं कृषि विकास में तेजी से वृद्धि,
- ⇒ समाज के दार्शनिक एवं धार्मिक दृष्टिकोण,
- ⇒ मनुष्य का प्राकृतिक पर्यावरण एवं प्रकृति के प्रति शत्रुतापूर्ण निर्दयी व्यवहार,
- ⇒ निर्धनता
- ⇒ कुछ देशों में कुछ वर्गों में आवश्यकता से अधिक समृद्धि, अर्थात् असमान आर्थिक विकास
- ⇒ प्राकृतिक संसाधनों का अविवेकपूर्ण एवं लोलुपतापूर्ण विदोहन।
- ⇒ जनसाधारण में पर्यावरण बोध तथा पर्यावरणीय समस्याओं के प्रति जागरूकता एवं जानकारी की कमी आदि।

आज वैश्विक स्तर पर पर्यावरण के संकट ने विकराल स्वरूप धारण कर लिया है। इसके परिणामस्वरूप सारा प्राकृतिक चक्र विगड़ गया है। किसी भी समय वारिश, आँधी, तूफान, सुनामी, भूकंप आदि की संभावनाएँ बनी रहती हैं। इसके कारण आपदा प्रबंधन सरकार का स्थाई कार्य बन गया है। बीमारियाँ बढ़ रही हैं, तनाव बढ़ रहा है। मनुष्य ने अपनी सुख, सुविधा के लिए प्रकृति का शोषण किया, उसी कारण से प्राकृतिक चक्र विगड़ गया और वह मनुष्य के दुःख का कारण बन रहा है। भारतीय मनीषियों ने कहा है कि सुख और दुःख एक सिक्के के दो पहलू हैं यह व्यवहार में सिद्ध हो रहा है।

पर्यावरण का शाब्दिक अर्थ है परिआवरण अर्थात् हमारे चारों ओर का वातावरण प्राकृतिक जगत जिसमें भूमि, जल, अग्नि, आकाश, वायु, जीव-जन्तु, जंगल का शोषण करके खिलवाड़ किया जिसके

परिणामस्वरूप गर्मी बढ़ रही है, तापमान 1 प्रतिशत बढ़ने से समुद्र का जल भी 1 मीटर बढ़ेगा, जिससे कई छोटे देश एवं समंदर किनारे के इलाके, बस्तियों पर एक नया संकट उत्पन्न हो सकता है। सौंदर्य प्रसाधनों के बढ़ते उपयोग के कारण 130 से अधिक प्रजातियाँ नष्ट हो गई हैं। भारत में वर्ष 2007 की तुलना में वर्ष 2017 तक भू-जल में 61 प्रतिशत की कमी आयी है। इसी प्रकार इ-वेस्ट का एक नया संकट दुनिया के समक्ष खड़ा हुआ है। भारत में 2007 की तुलना में 2020 में मात्र संगणक (कम्प्यूटर) का कूड़ा (वेस्ट) पाँच सौ प्रतिशत बढ़ गया है। हर वर्ष हम 80 लाख टन कूड़ा-कचरा समुद्र में डालते हैं, जिसके परिणामस्वरूप समुद्र में रहने वाले जलचर का अस्तित्व संकट में है।

विकास के नाम पर वनों की कटाई अंधा-धुंध हो रही है। देश में 33 प्रतिशत वन प्रदेश होना चाहिए। परंतु सरकार के आँकड़ों के अनुसार 22 प्रतिशत वन प्रदेश हैं। हमने प्राकृतिक जगत के खिलवाड़ में आकाश को भी नहीं छोड़ा है। वर्ष 2018 तक विभिन्न देशों के द्वारा कुल 4857 उपग्रह छोड़े गए थे उसमें से 2600 से कम कार्यरत हैं, बाकी उपग्रहों का कचरा (वेर टु) आकाश में तैर रहा है। इस सब के परिणामस्वरूप विश्व में हर वर्ष 90 लाख लोगों की मृत्यु इस पर्यावरण प्रदूषण के कारण हो रही है। विश्व की जनसंख्या आरंभ में कम थी। पर्यावरणीय प्रभाव कम थे तथा विश्व में अमन चैन की जीविका लोग व्यतीत करते थे। धीरे-धीरे जनसंख्या बढ़ी तथा समस्त आवश्यकताओं की पूर्ति हेतु बाजारों का प्रादुर्भाव हुआ। औद्योगिक क्रांति आई और आर्थिक परिदृश्य बदला तथा इसके साथ-साथ पर्यावरण में परिवर्तन आये। बाजारों में भी तरह-तरह के परिवर्तन आये। आज की स्थिति ऐसी है कि प्रदूषण भी बाजारों में विकने लगा है। प्रदूषित वस्तुएँ यदि रीसाइकिल कर दी जायें तो बहुत कुछ पर्यावरणीय संकट हल हो सकता है अतः वर्तमान बाजार में वह वस्तुएँ भी विक रही हैं जो पर्यावरणीय विषैले पदार्थों का क्रय-विक्रय करके नई वस्तुओं का निर्माण कर रहे हैं। यह एक प्रकार की बाजार की उपलब्धि है कि बाजार में प्रदूषण फैलाने वाली वस्तुएँ भी आर्थिक महत्व की होती जा रही हैं। इस प्रकार बाजारों के तरीके परिस्थितियों पर ही मूलतः निर्भर होते हैं।

पर्यावरण में किसी प्रदूषक द्वारा फैलाये जाने वाले प्रदूषण की मात्रा का निर्धारित शुल्क, पर्यावरण जुर्माना कहलाता है। इसका एक मापक होता है, उससे अधिक प्रदूषण फैलाने का जुर्माना लगता है। प्राकृतिक संसाधनों के बदले या एकत्रित करने या प्रदूषकों के नष्ट करने के बदले में लिया जाने वाला शुल्क प्रदूषण जुर्माना कहलाता है। उत्पाद शुल्क उस पर लगता है जिस वस्तु या उत्पाद के बारे में यह ज्ञात हो, कि यह वस्तु पर्यावरणीय दृष्टि से हानिकारक है। प्रदूषकों का एकत्रीकरण हो या विनिष्टीकरण दोनों पर जुर्माना लगता है। इस प्रकार का शुल्क सामान्य राजस्व का भाग होता है। प्रदूषण शुल्क निम्न गतिविधियों पर वसूल किया जाता है जैसे - आपके द्वारा कितनी मात्रा में प्रदूषक पर्यावरण में छोड़े जा रहे हैं। उसके अनुसार आपसे शुल्क लिया जायेगा, जैसे - ठोस उत्सर्जनों को नष्ट करने का शुल्क इत्यादि।

कई प्रकार के शुल्क उत्पादों पर वसूले जाते हैं। जो सामूहिक रूप से भी एकत्रित किये जाते हैं या व्यक्तिगत रूप से भी वसूले जाते हैं। संधीय तौर पर वायु, जल प्रदूषण के शुल्क वसूले जाते हैं परंतु राज्य स्तर

पर भी सरकारों द्वारा यह निर्धारित करने पर लगाए जाते हैं कि अमुक गतिविधि पर्यावरण विरोधी है। राज्य स्वतंत्र है कि किस प्रकार की गतिविधि पर कर/जुर्माना लेना है जुर्माना पद्धति से प्रदूषण की गतिविधि कम होती है। यह जुर्माना किसी भी रूप में हो सकता है चाहे वह कर हो या शुल्क हो। प्रदूषक की मात्रा पर यह कर या जुर्माना या शुल्क निर्धारित किया जाता है। प्रदूषण नियंत्रण हेतु और भी कई कानून समय एवं परिस्थितियों के अनुसार बनते रहते हैं, जिनसे पर्यावरण को नष्ट करने या क्षति पहुँचाने वाले को विभिन्न प्रकार के दंड देने के प्रावधान हैं, जैसे - धारा 41 में जल स्रोतों से पानी लेने पर दण्ड का प्रावधान है। धारा 43 नदी एवं कुएँ की प्रदूषित सामग्री के उपयोग पर रोक लगाती है। इसमें 6 माह से 6 वर्ष तक की कैद का प्रावधान है। इसी प्रकार धारा 44 गंदा पानी बाहर फेंकने पर रोक लगाती है एवं उस पर दंड की भागीदारी तय होती है तथा धारा 45 में इस बात का प्रावधान है कि यदि ऊपर वर्णित नियमों के विपरीत पुनः दोषी माना जाता है तो उसे आर्थिक दंड के साथ 1 से 7 वर्ष तक की कैद का प्रावधान है। धारा 46 में पुनः उल्लंघन करने पर उसके अपराध का प्रचार-प्रसार किया जाएगा।

**निष्कर्ष -** उपर्युक्त अध्ययन से स्पष्ट होता है, कि पर्यावरण अवनयन के लिए जिम्मेदार प्रक्रमों एवं कारणों से भावी जीवन के प्रति निराशा जाग्रत होती है तथा यह भी आभास होता है, कि सभी विकासीय कार्य प्रकृति तथा पर्यावरण के विपरीत हैं। ज्ञातव्य है कि यदि हमें वर्तमान समाज को विकसित करना है तथा बढ़ती जनसंख्या की माँगों को पूरा करना है तो विकास की गति को बनाये रखना होगा परंतु विकास कार्य पर्यावरण एवं मानव समुदाय के अस्तित्व की कीमत पर नहीं किया जाना चाहिए विकास के नाम पर प्राकृतिक संसाधनों का दोहन हो रहा है क्योंकि किसी भी देश की अर्थव्यवस्था प्राकृतिक संसाधनों की माँग तथा उसकी गुणवत्ता पर आधारित होती है। वनों से ईंधन, मिट्टी से कृषि उपजें प्राप्त होती हैं। आर्थिक लाभ की अन्य वस्तुएँ भी वनों से प्राप्त होती हैं जैसे - गोंद, अचार की चिरौंजी, हर्-बहेड़ा, आँवला, शहद आदि आर्थिक महत्व की वस्तुएँ प्राप्त होती हैं। कच्चे माल के रूप में भूगर्भ से अनेक प्रकार के खनिज प्राप्त होते हैं जो अर्थव्यवस्था को प्रभावित करते हैं। आर्थिक दृष्टि से देखें तो प्राकृतिक संसाधनों का विशेष महत्व है। मनुष्य एवं प्रकृति में एक अटूट रिश्ता है। यदि हम अपनी विलासिता को कम कर दें, वस्तुओं के उपभोग की प्रवृत्ति पर अंकुश लगा दें तो निश्चित ही पर्यावरणीय समस्याओं का आर्थिक हल स्वमेव हो जायेगा। आर्थिक लोलुपता यदि रूक जाती है तो पर्यावरण की अनेक समस्याएँ हल हो सकती हैं।

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## पर्यावरण लेखांकन अनुसंधान का महत्व

सुप्रिया यादव

अतिथि विद्वान (वाणिज्य)

शासकीय स्वशासी कन्या स्नातकोत्तर उत्कृष्टता महाविद्यालय सागर (म.प्र.)

सारांश -

अर्थव्यवस्था में प्राकृतिक पर्यावरण द्वारा निर्भाई गई भूमिका को समझने के लिए पर्यावरण लेखांकन एक महत्वपूर्ण उपकरण है। पर्यावरण लेखांकन एक ऐसा शब्द है, जिसका उपयोग प्राकृतिक संसाधनों के उपयोग या कमी को शामिल करने के लिए, राष्ट्रीय लेखा प्रणाली के संसोधन को संदर्भित करता है। पर्यावरण लेखांकन आर्थिक संसाधनों के साथ-साथ पर्यावरण प्रदूषण और संसाधन क्षरण द्वारा लगाई गई लागतों के साथ प्राकृतिक संसाधनों के योगदान संबंधित आँकड़े प्रदान करता है। इस प्रकार पर्यावरण लेखांकन आर्थिक निर्णय लेने की सुविधा के लिए व्यावसायिक इकाई के पर्यावरणीय रूप से आँकड़ों के संचार को संदर्भित करता है। यद्यपि पर्यावरणीय लेखांकन की अवधारणा मानक लेखा पद्धतियों का न होना, निम्नस्तरीय मूल्यांकन तकनीक, दीर्घकालिक प्रक्रिया और उद्योगों से संबंधित विश्वसनीय आँकड़ों की कमी जैसी कुछ समस्याओं से ग्रसित है, परंतु फिर भी यह "विकास" के निष्पक्ष मूल्यांकन तक पहुँचने और पर्यावरणीय पारदर्शिता को बढ़ावा देने हेतु एक महत्वपूर्ण उपकरण के रूप में उभर रहा है।

मुख्य शब्द - पर्यावरण लेखांकन, लागत, संसाधन, मूल्यांकन, कम्पनी।

पर्यावरण लेखांकन के उद्देश्य - पर्यावरण में परिवर्तन न केवल पर्यावरण पर बल्कि अर्थव्यवस्था पर भी बुरा असर डालता है और यह एक सर्वविदित तथ्य है, कि अर्थव्यवस्था में बदलाव का किसी भी व्यवसाय में होने वाले परिवर्तनों पर सीधा असर पड़ता है। यह भी ध्यान रखना महत्वपूर्ण है, कि किसी देश का सकल घरेलू उत्पाद, पर्यावरण और जलवायु परिवर्तन से प्रभावित हो सकता है। इसलिए यह व्यवसायों के लिए पारंपरिक आर्थिक लक्ष्यों के बीच संभावित 'क्विड प्रोक्वो' को समझने और प्रतिबंधित करने का सबसे अच्छा साधन है। यह नीतिगत मुद्दों के विश्लेषण के लिए उपलब्ध महत्वपूर्ण जानकारी को भी बढ़ाता है। खासकर जब जानकारी के महत्वपूर्ण भाग को अक्सर अनदेखा कर दिया जाता है। पर्यावरण लेखांकन का उद्देश्य सकल घरेलू उत्पाद के उस हिस्से की पहचान करना है, जो आर्थिक विकास के नकारात्मक प्रभावों की क्षतिपूर्ति के लिए आवश्यक लागतों यानी रक्षात्मक व्यय को दर्शाता है। इसमें पर्यावरणीय लागतों और लाभों का मूल्यांकन किया जाता है। पर्यावरण लेखांकन मौद्रिक पर्यावरण खातों के साथ भौतिक संसाधन खातों की कड़ी स्थापित करता है, एवं पर्यावरणीय रूप से समायोजित उत्पाद और आय के संकेतक का विस्तृत मापन करता है।

पर्यावरण लेखांकन के प्रमुख चरण - किसी भी संस्था या संगठन की पर्यावरण के संदर्भ में गुणवत्ता का पता लगाने के लिए विभिन्न अध्ययनों के आधार पर छः चरणों की पहचान की गई है। इनका उपयोग करके किसी भी संस्था द्वारा पर्यावरणीय लेखांकन को सुचारु रूप से संपादित किया जा सकता है।

- ⇒ पहचान : पर्यावरणीय लेखांकन प्रक्रिया में पहला कदम पर्यावरणीय रिपोर्टिंग करने वाले मापदंड की पहचान करना होता है प्रत्येक संगठन अपनी आवश्यकताओं के अनुसार पर्यावरणीय मापदंडों को परिभाषित करता है।
- ⇒ वर्णन : पर्यावरणीय रिपोर्टिंग मापदंडों को परिभाषित करते समय पर्यावरणीय लेखांकन प्रक्रिया के दूसरे चरण में संगठनों को अपने द्वारा निर्धारित प्रत्येक घटक के परिचालन के अर्थ को स्पष्ट रूप से बताने की आवश्यकता होती है। यह चरण उन्हें दीर्घकालिक पर्यावरणीय प्रदर्शन को मापने में मदद करता है।
- ⇒ विशिष्टता : अगला चरण पर्यावरणीय लक्ष्यों की पहचान करना होता है। संगठन द्वारा अल्पकालिक लक्ष्यों के साथ-साथ दीर्घकालिक पर्यावरणीय लक्ष्यों को भी निर्धारित किया जाना चाहिए।
- ⇒ विकास : पर्यावरण का प्रदर्शन करने वाले संकेतकों का निर्माण करना, पर्यावरण लेखांकन में एक महत्वपूर्ण कदम होता है। इसके अंतर्गत पर्यावरण नीति की संरचना, अपनाए जाने वाले स्वास्थ्य और सुरक्षा मानक, लागू की जाने वाली ऊर्जा संरक्षण रणनीतियाँ, डिजाइन किए जाने वाले अपशिष्ट एवं जल प्रबंधन नीतियों को शामिल किया जाता है।
- ⇒ मापन : पर्यावरण का प्रदर्शन करने वाले पारंपरिक संकेतकों के साथ-साथ वास्तविक पर्यावरणीय प्रदर्शन का मापन करना अत्यंत ही आवश्यक होता है। यह मापन प्रकृति में गुणात्मक अथवा मात्रात्मक हो सकता है।
- ⇒ रिपोर्ट तैयार करना : पर्यावरणीय लेखांकन का अंतिम चरण पर्यावरणीय प्रदर्शन परिणाम के दस्तावेज को तैयार करना है।

#### औचित्य और महत्त्व -

- ⇒ पर्यावरण लेखांकन, परंपरागत लेखांकन पद्धतियों से भिन्न होता है, जिनका सामान्यतः एक आयामी दृष्टिकोण होता है और केवल एक संगठन के वास्तविक प्रभावों का लाभ और हानि का लेखांकन विधियों के माध्यम से मापन करते हैं।
- ⇒ पारिस्थितिकीय लेखांकन के विपरीत यह मौद्रिक रूप में एक कंपनी पर प्राकृतिक पर्यावरण के प्रभावों का आकलन करता है, जिसमें भौतिक माप में पर्यावरण पर प्रभाव का मापन किया जाता है।
- ⇒ यह संदूषित स्थलों की साफ-सफाई या उपचार की लागत, पर्यावरण जुर्मानों, दंड, करों तथा प्रदूषण रोकथाम प्रौद्योगिकियों की खरीद एवं अपशिष्ट प्रबंधन लागत की जाँच करता है।

- ⇒ यह पर्यावरण संबंधी जोखिम में परिवर्तित होने वाले गंभीर पर्यावरणीय विस्थापन और परिणामों को रोकने में महत्वपूर्ण भूमिका निभाता है।
- ⇒ पर्यावरणीय संसाधनों का उपयोग करते समय यह उपभोक्ताओं व्यावसायिक साझेदारों, निवेशकों और कर्मचारियों जैसे हितधारकों के प्रति, संगठनों के उत्तरदायित्व को पूरा करने में सहायता करता है।

#### भारत में पर्यावरणीय लेखांकन की प्रगति -

- ⇒ भारत में पर्यावरण लेखांकन की संकल्पना तथा इसके विधिक आयाम प्रगतिशील अवस्था में है। कंपनी अधिनियम 2013 के अंतर्गत कंपनियों को उनकी स्थिति और वित्तीय प्रदर्शन के साथ-साथ संसाधनों एवं पर्यावरणीय संरक्षण का समय-समय पर मूल्यांकन का प्रावधान किया गया है।
- ⇒ वर्ष 2011 में कॉर्पोरेट सामाजिक उत्तरदायित्व में सुधार करने के लिए, कॉर्पोरेट मामलों के मंत्रालय ने कंपनियों की सामाजिक, पर्यावरणीय, एवं आर्थिक जवाबदेही पर राष्ट्रीय दिशानिर्देश (NVGs) जारी किये थे। राष्ट्रीय कंपनी स्वैच्छिक दिशानिर्देश के सिद्धांत 6 में इस बात पर जोर दिया गया कि 'सभी व्यावसायियों को' पर्यावरण के सम्मान तथा संरक्षण को समान महत्व प्रदान किया जाना चाहिए।
- ⇒ राष्ट्रीय कंपनी स्वैच्छिक दिशा निर्देश 2011 के अनुसार, प्राकृतिक तथा मानव पूँजी का प्रयोग करके कचरे को एकत्रित करना, उसके नियंत्रक एवं पुनर्चक्रण के माध्यम से सामग्री के पुनः उपयोग को बनाए रखना चाहिए। एवं कंपनी को अपनी कार्यवाहियों के अंतर्गत प्रदूषण के निर्गमन को रोकने एवं नियंत्रित करने के प्रयास शामिल किए जाने चाहिए। इनके द्वारा समयबद्ध तरीके से पर्यावरणीय क्षति तथा लागत का मूल्यांकन किया जाना चाहिए।
- ⇒ संगठनों तथा कंपनियों को उनकी गतिविधियों से उत्पन्न होने वाले पर्यावरणीय जोखिमों का समय-समय पर मूल्यांकन करने के साथ प्राप्त होने वाले निष्कर्षों का निष्पक्ष तौर पर हितधारकों के सामने प्रकट करना चाहिए।

#### पर्यावरण लेखांकन की चुनौतियाँ -

- ⇒ कंपनियों द्वारा रिपोर्ट की गई अधिकांश पर्यावरणीय जानकारियाँ गैर वित्तीय रूप में दर्ज की जाती हैं। ऐसी जानकारियाँ कंपनी द्वारा किए गए प्रयासों का विवरण मात्र होती हैं। जिन्हें पर्यावरण लेखांकन में प्रयुक्त नहीं किया जा सकता है। अनेक मामलों में इस तरह की पहल के लिए खर्च की गई राशि और वित्तीय परिणामों पर इसके भौतिक प्रभाव की जानकारी पूरी तरह से गायब रहती है।
- ⇒ लेखांकन करने के लिए चयनित की गई कंपनियों की लेखांकन शैली तथा विषयवस्तु में व्यापक भिन्नता पाई जाती है। तुलनात्मक अध्ययन तथा सत्यापन की कमी की समस्या लगभग सभी लेखांकन

प्रक्रियाओं में देखी जा सकती है। अतः यह महसूस किया जाता है, कि एक विश्वसनीय लेखांकन प्रक्रिया के लिए ऐसी जानकारी को वित्तीय लेखांकन प्रक्रिया के साथ रचीकृत किया जाना चाहिए।

→ आंतरिक तथा बाह्य लागतों के एकीकरण करने के संदर्भ में भी एक प्रमुख समस्या दृष्टिगत होती है। आंतरिक लागतों के अंतर्गत कॉरपोरेट क्षेत्र द्वारा विभिन्न चरणों में किया गया निवेश शामिल रहता है, तो वहीं दूसरी तरफ बाह्य लागतों के अंतर्गत मृदाक्षरण, जैवविविधता की हानि, वायु प्रदूषण, जल प्रदूषण, ध्वनि प्रदूषण तथा ठोस कचरे की समस्या जैसे पहलुओं को शामिल किया जाता है। उपरोक्त दोनों के एकीकरण के लिए एक विशिष्ट मौद्रिक आकलन प्रक्रिया की आवश्यकता होगी। इसके आलावा, यह तय करना भी अत्यंत कठिन है कि एक विशिष्ट व्यावसायिक इकाई की स्थापना के कारण पर्यावरण को कितना नुकसान हुआ है। यह चुनौती मौजूदा पर्यावरणीय लेखांकन के द्वांचागत विकास में बाधक है।

**निष्कर्ष -** भारत में पर्यावरणीय लेखांकन की प्रक्रिया को बेहतर बनाने के लिए सरकार तथा व्यावसायिक घरानों को एक स्पष्ट तथा ठोस पर्यावरणीय लेखांकन नीति तैयार करनी होगी। आर्थिक प्रक्रिया के दौरान उत्पन्न होने वाले प्रदूषण के नियंत्रण के लिए पर्याप्त कदम उठाने के साथ-साथ इनका लेखांकन किया जाना तथा समयबद्ध रूप में प्रकाशित करना अत्यंत आवश्यक है। आर्थिक विकास तथा पर्यावरण संरक्षण वर्तमान समय की माँग है अतः इनके मापन के लिए उचित कार्यान्वयन तथा एक स्पष्ट लेखांकन प्रक्रिया की आवश्यकता है।

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# PHYTOSOCIOLOGICAL STUDY OF GOPALPURA FOREST

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## **Abstract -**

*Present paper deals with the evaluation of vegetation in Gopalpura site of tropical dry deciduous forest of Sagar. Tropical dry deciduous forests of Sagar (Gopalpura) are under constant threat due to over exploitation for various socio-cultural reasons and increasing growth of pharmaceutical industries. Further, the other disturbances due to overgrazing frequent fires etc. one also exerting constant pressure on the vegetation. The present work is aimed to study the existing vegetation of tropical dry deciduous forest of Sagar at Gopalpura.*

*The climate of the study well defined seasons viz. summer, winter and rainy. Soil of the study area are derived from two different soil formation i.e. basalt and vindhyan sandstone.*

**Key words:** Vegetation, Tropical dry deciduous forest, Phytosociological.

## **Introduction -**

The term phytosociology is self explanatory. It is study of inter relationship of individuals of many species growing together or a set of individuals of a species growing together in the field. More usually, however, it means the study of sets of species forming communities under natural condition. Phytosociological investigations in forest of India have been carried out by a number of workers. Studies on various aspects of Sal forests in different part of India (Tiwari, 1967; Kumar et al., 1994; Pandey, 1999; Shah et al., 1978; Rao and Balasubramanian, 1993; Shah and Bhatt, 1980).

Study of vegetation composition is fundamentally essential for understanding

the structural aspects of community, as Braun Blanquet (1932) has long back conceived the idea of existence of social relations between various species. Oosting (1956) has suggested the importance of a few phytosociological parameters for expressing sociological behavior of plants.

Vegetation ecology is the study of both the structure of vegetation and vegetation systematics. This includes the investigation of species composition and sociological interaction of species in communities from broad Physiognomic formation to the very fine floristic pattern occurring on a small area. Further, it is much concerned with correlations between environment and vegetation (Muller-Dombois and Ellenberg, 1974). It is concerned not only with identifying the plant communities on an area, but also with determining how they are related to one another and to the environmental factors.

Tropical dry deciduous forest of Sagar are under constant threat due to over exploitation for various socio-cultural reasons and increasing growth of pharmaceutical industries. Further, the other disturbance due to overgrazing, frequent fires are also exerting constant pressure on the vegetation.

#### **Study Sites -**

This site is situated 9 kilometers away on Sagar-Jhansi road (NH-26). It lies at 22°53'N latitude and 77°40'E longitude. Forests consist of medium sized trees due to moderate biotic disturbances. The feeling gaps are well regenerated by seedlings and coppices of forest tree species.

Tree layer is dominated by *Lanea coromandelica* and *Terminalia arjuna* and *Diospyros melanoxylon* are other associated species. Shrub layer is dominated by *Lantana camara* and *Zizyphus oenoplia*, *Mitreola oldenlandioidea* and *Cassia tora* cover the maximum part of ground flora. Main geological formation on this site is vindhyan sandstone (Plate 01).

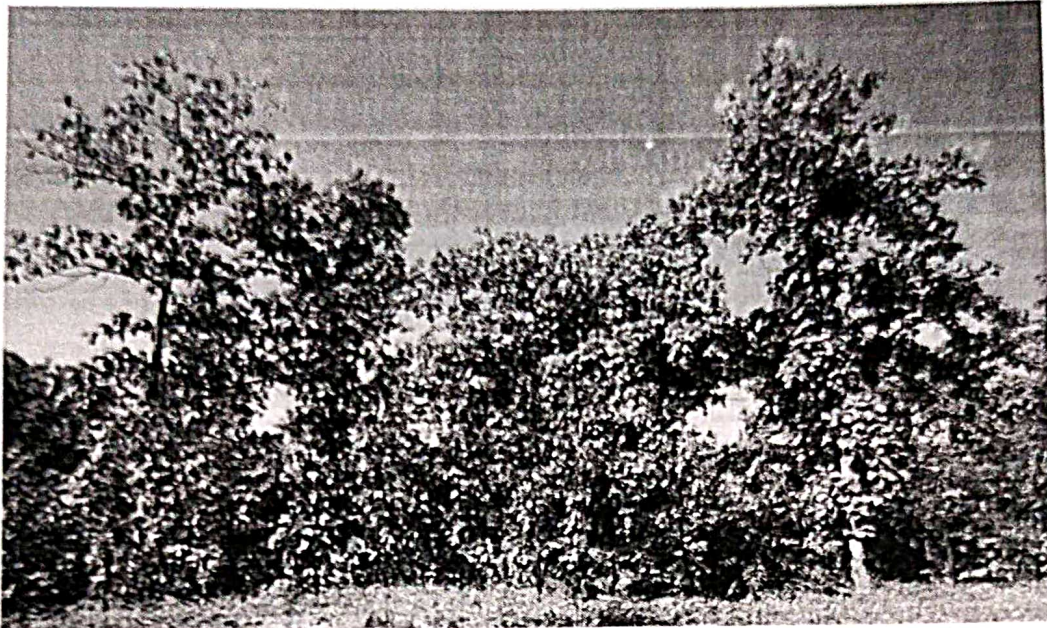


Plate 01: A view of forest vegetation at Gopalpura site

### **Climate :**

In general, climatic condition of the entire district is more or less alike due to similar topographic features.

On the basis of rainfall, temperature and humidity condition, the climate of Sagar district can broadly be termed as seasonal. The year is divisible into three well marked seasons i.e. rainy, winter, and summer. The rainfall in this area is distinctly seasonal and nearly 90% of the total rainfall is received in the rainy season i.e. from June to September. Relative humidity is one of the most important climatic factor governing the growth of plants like temperature, relative humidity also varies from season to season.

### **Materials and Methods -**

After surveying the study area, representative site, Gopalpura was selected. At study site Quadrats of 10 x 10 m size were randomly placed for the analysis of tree layer. Shrub layer was analysed laying quadrats of 5 x 5 m at study site. Cover and number of individuals were recorded.

Herb layer was analysed laying quadrats of 1 x 1 m at study site. Line transects

of 1 meter length was considered for recording of cover area of herbs. At study site seedlings and saplings of tree species were also recorded.

#### **Data Analysis -**

The vegetation data were quantitatively analysed for frequency, density, abundance and basal area (Curtis and McIntosh, 1950).

#### **Importance Value Index (IVI) -**

Relative values of frequency, density and dominance were determined Mishra (1968). The sum of all above relative values represented importance value index (IVI) on the basis of IVI, dominant, co-dominant and main associate species were recognized in different sites (Mueller-Dombais and Ellenberg, 1974). Standard formulae were used for the above analysis.

Table 1: Composition of forest tree vegetation at Gopalpura

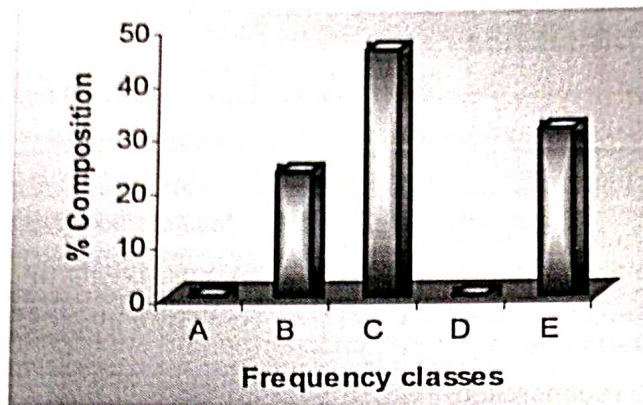
S. No.	Name of plant species	Frequency %	Density (plants ha <sup>-1</sup> )	Abundance	A/F Ratio	Basal area (m <sup>2</sup> )	Relative Dominance	Relative Density	Relative frequency	Importance Value Index (IVI)
1.	<i>Tectona grandis</i>	100	450	4.5	0.045	2.69108	35.03	24.65	12.90	72.58
2.	<i>Diospyros melanoxylon</i>	100	375	3.75	0.037	0.71101	9.25	20.54	12.90	42.69
3.	<i>Cassia fistula</i>	100	325	3.25	0.032	0.15875	2.06	17.80	12.90	32.76
4.	<i>Butea monosperma</i>	100	175	1.75	0.017	0.24745	3.22	9.58	12.90	25.7
5.	<i>Anogeissus latifolia</i>	50	50	1	0.02	1.05768	13.76	2.73	6.45	22.94
6.	<i>Bridelia retura</i>	50	50	1	0.02	0.7802	10.15	2.73	6.45	19.33
7.	<i>Schleichera oleosa</i>	50	50	1	0.02	0.70417	9.16	2.73	6.45	18.34
8.	<i>Lagerstroemia parriflora</i>	50	100	2	0.04	0.15589	2.02	5.47	6.45	13.94
9.	<i>Adina cordifolia</i>	25	25	1	0.04	0.70350	9.15	1.36	3.22	13.73
10.	<i>Acacia leucophloea</i>	50	75	1.5	0.03	0.12452	1.62	4.10	6.45	12.17
11.	<i>Buchanania lanzab</i>	50	50	1	0.02	0.1787	2.32	2.73	6.45	11.5
12.	<i>Terminalia tomentosa</i>	25	75	3	0.12	0.04793	0.6239	4.10	3.22	7.94
13.	<i>Lannea coromandelica</i>	25	25	1	0.04	0.12109	1.57	1.36	3.22	6.15

Table 2: Composition of shrub vegetation at Gopalpura

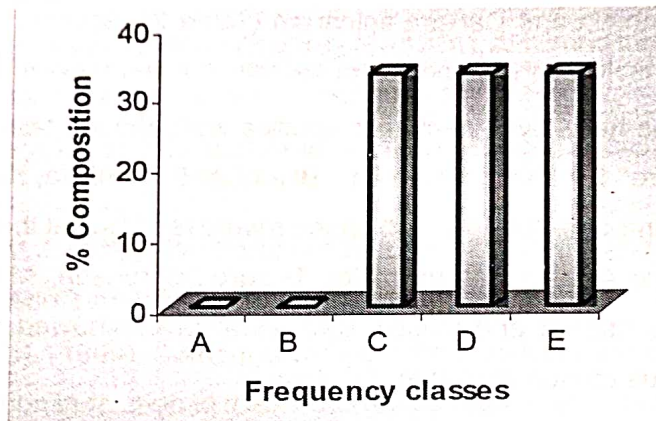
S. No.	Name of plant species	Frequency %	Density (plants ha <sup>-1</sup> )	Abundance	A/F Ratio	Relative Dominance	Relative Density	Relative frequency	Importance Value Index (IVI)
1.	<i>Gymnosporia spinosa</i>	100	500	1.25	0.012	23.57	50	44.44	118.01
2.	<i>Zizyphus oenoplia</i>	75	300	1	0.013	43.90	30	33.33	107.23
3.	<i>Carissa spinarum</i>	50	200	1	0.02	32.52	20	22.22	74.74

Table 3: Composition of herb layer at Gopalpura

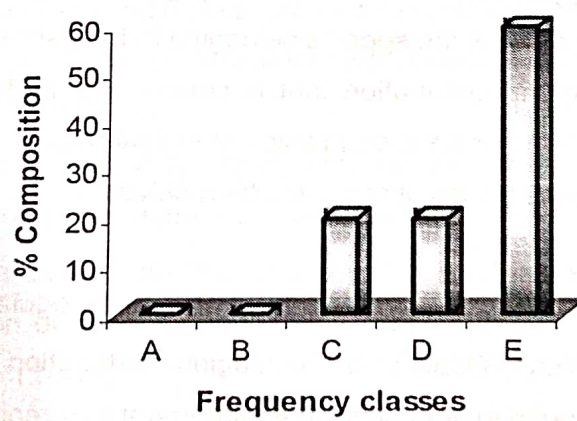
S. No.	Name of plant species	Frequency %	Density (plants m <sup>-2</sup> )	Abundance	A/F Ratio	Relative Dominance	Relative Density	Relative frequency	Importance Value Index (IVI)
1.	<i>Bridens bifernata</i>	100	4.75	4.75	0.047	16.03	23.45	12.5	51.98
2.	<i>Sida veronicaefolia</i>	100	3.5	3.5	0.035	11.45	17.28	12.5	41.23
3.	<i>Bryonopsis laciniosa</i>	75	2.5	3.33	0.044	16.03	12.34	9.37	37.74
4.	<i>Xanthium strumarium</i>	100	1.75	1.75	0.017	13.99	8.64	12.5	35.13
5.	<i>Tridax procumbens</i>	100	2.25	2.25	0.022	8.39	11.11	12.5	32
6.	<i>Alysicarbus monilifer</i>	100	1.5	1.5	0.015	9.92	7.40	12.5	29.82
7.	<i>Eragrostis tenella</i>	75	1.25	1.66	0.022	4.83	6.17	9.37	20.37
8.	<i>Mitreola oldenlandiodes</i>	50	0.5	1	0.02	9.16	2.46	6.25	17.87
9.	<i>Achyranthes aspera</i>	50	1.25	2.5	0.025	4.58	6.17	6.25	17
10.	<i>Cassia tora</i>	50	1	2	0.04	5.59	4.93	6.25	16.77



Tree



Shrub



Herb

Fig. 1: Frequency diagram of different communities at Gopalpura

## Result and Discussion -

Values of IVI indicate that *Tectona grandis* showed highest IVI (Table 1). While co-dominant species of the site were *Diospyros melanoxylon* and *Cassia fistula*. Most of the tree species showed random distribution. While the total composition of vegetation appear to be heterogeneous (Fig. 1).

In this site 1310 seedlings and 2270 saplings were found. The maximum number of seedlings recorded in *Butea monosperma* and saplings in *Diospyros melanoxylon* showing good regeneration.

Shrub layer was dominated by *Gymnosporia spinosa* and other species were *Zizyphus oenoplia* and *Carissa spinarum* (Table 2). Species composition of site was homogeneous. Majority of species of the site showed regular distribution.

In the herb layer, dominant species were *Bidens biternata* while co-dominant species were *Sida veronicaefolia*, *Bryonopsis laciniosa*, *Xanthium strumarium* and *Tridax procumbens*. Total 10 herb species were recorded at the site (Table 3). Common species were *Alysicarpus monilifer*, *Eragrostis tenella*, *Mitreola oldenlandioidea*, *Achyranthes aspera* and *Cassia tora*. Herb layer showed regular distribution and homogeneous composition (Fig. 1).

Maximum importance value index of species indicates its dominance and ecological success, its good power of regeneration and greater ecological amplitude. In the study area, most of the species belonging to tree, shrub and herb layers in general showed contagious distribution that is commonest pattern in nature. The trend of distribution pattern depends on physic - chemical nature of environment as well as on the biological peculiarities of organism themselves. Trend of distribution in general was as follows.

Contagious > random > regular

According to Odum (1971) contagious distribution is common in nature, random distribution is found in very uniform environment and regular distribution occurs under severe competition.



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# An Overview of Poisonous Plants in India

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## Abstract -

Indian continent supports a wide diversity of plants and most of them are known for their medicinal value. Different types of bioactive compounds are found in plants, which are directly and indirectly beneficial for plants, animals as well as humans. Apart from this, several plant species contain some toxic compounds that affect the health of many forms of life as well as cause their death. Therefore, it is essential to know in what quantity they should be taken so that it does not harm health. This review on poisonous plants is to explore the current knowledge about poisonous plants in India. The present review will be helpful to different pharmaceutical industries, the scientific community and general public awareness around the world.

**Keywords :** India, Poisonous plants, Bioactive compounds, Toxicity

The bonding between plants and animals is unbreakable, the relationship between humans and plants is as old as the existence of human beings on earth (Husaini et al., 2020). According to the report published by the World Health Organization (WHO), it is estimated that about 80% of the population from developing countries depend on traditional medicine for their primary health care (Tewari, 2000).

The plants have multiple secondary metabolites, which are to protect them from adverse conditions and these metabolites include alkaloids, phenolics, flavonoids, terpenoids and glycosides (Zlati & Stankovi, 2017). These secondary metabolites and other plant products may have therapeutic properties and are biologically and pharmacologically active. Furthermore, some plants are toxic to both humans and animals due to the presence of harmful by-products, these plants are known as poisonous plants. These plants can be found around the world, and are being used by indigenous people

for various uses such as fishing, hunting, and the treatment of different diseases (H. Bhatia, R. K. Manhas, K. Kumar, & R. Magotra, 2014b).

The poisoning of humans may occur through different means such as from contact with plant parts (skin irritation), ingestion (internal toxicity), absorption, inhalation etc. (Tamilselvan, Thirumalai, Shyamala, & David, 2014). These plant toxins can be divided into several groups based on their effect on humans such as gastrointestinal toxins, cardiovascular toxins, convulsive toxins, anti-cholinergic toxins, nicotine and nicotine-like alkaloids, calcium oxalate crystals and cellular respiration toxins (Achour et al., 2022).

However, local elderly people pass the knowledge of poisonous plants from one generation to the next one, but it is very important to provide general awareness regarding their toxicological profiles (Huai & Xu, 2000). Hence, the focus of this short review is to explore the current knowledge about some poisonous plants, as well as the compounds found in these plants that are responsible for their toxicity to humans and other animals. Some of the major poisonous plants are further described below-

***Agave sisalana*** - *Agave sisalana* is among the important plant used as toothbrush sticks by several people who cannot afford to buy a commercial toothbrush and toothpaste (Kassu, Dagne, Abate, Castro, & Van Wyk, 1999). This plant is also known by different other vernacular names Rambans (Indians) and Garingboom (Africans). Skin contact with the sap from the cut leaves produces burning, redness, tingling and enlarging.

***Abrus precatorius* Linn** - The seeds of *Abrus precatorius* (Indian licorice, Fabaceae) are highly toxic and contain some active compounds, such as abrine, abrasine, abraline, abrin, abricin, abrusgenic acid, etc. (Das, Jain, & Mishra, 2016). Abrin is more toxic than the other active compounds, which is a toxalbumin that inhibits protein synthesis and causes cell death (Narayanan, Surendranath, Bora, Surolia, & Karande, 2005). Even consuming one of its seeds can be fatal for both children and adults. The lethal dose or (LD<sub>50</sub>) of abrin toxin for humans is 0.1-1 µg/kg body weight (Karthikeyan & Amalnath, 2017).

***Aconitum ferox* (Syn *Aconitum atrox*)** - *Aconitum ferox* (Indian aconite, Ranunculaceae), is an erect and perennial herb whose distribution ranges from temperate

to alpine regions of India, Nepal, Bhutan and China(Agnihotri, Husain, Katiyar, & Husain, 2016; Ghimire, Sapkota, Oli, & Parajuli, 2008; Polunin & Stainton, 1984). It is a rhizomatous poisonous herb with medicinal properties when used after vigorous purification and in the right amounts(Hanuman & Katz, 1993a, 1993b). The plant is used as a poison for arrowheads(Rokaya, Münzbergová, & Timsina, 2010). The lethal dose of aconitine in human is 2 to 6 mg/kg body weight(Regmi, Ravikrishna, Bhat, & Hebbar, 2020).

***Aesculus indica*** - *Aesculus indica* (Indian horse-chestnut or Himalayan horse chestnut, Hippocastanaceae) is widely distributed in low-temperature regions of the world and is commonly found in North Western Himalayas in the Indian context (Kaur, Joseph, & George, 2011). *A. indica* is large sized deciduous and perennial tree species that attains a height of up to 20 m. It is widely used in traditional medicine systems to treat many diseases. *A. indica* is poisonous to humans and other animals due to the presence of a saponin-class toxin called escin or aesculin. After ingestion, aesculin enters the blood and destroys red blood cells. The young leaves and flowers of this plant species are more toxic than mature leaves. The bark and seeds also contain small amounts of aescin(Jamloki, Trivedi, Nautiyal, Semwal, & Cruz-Martins, 2022). *A. indica* poisoning can cause fatigue, paralysis, coma, and even death. The lethal dose or LD50 was observed to be 10.6 mg/g body weight for chicks with a single dose of the seed extract (*A. indica*) and 10.7 mg/g body weight with the hamster. Administration of *A. indica* for two consecutive days showed 6.5 mg/g LD50(Yadav et al., 2022).

***Citrullus colocynthis*** - *Citrullus colocynthis*(Curcubitaceae) is an ancient medicinal plant (Lloyd & Cincinnati, 1898). Its well-known names in English are harsh apple, severe cucumber, colocynth and unpleasant gourd (Rahimi, Amin, & Ardekani, 2012).*Citrullus colocynthis* causes cerebral pain, stomach issues, and sickness in freezing conditions and diarrhoea and irritation in exceptionally hot conditions. Toxic measurements of *C. colocynthis* might cause colic, runs, hematochezia, nephrosis and spewing. Deadly dosages might cause spasms, loss of motion and conceivably passing brought about by circulatory collapse (Duke, Duke, & Ducellier, 2008).The seed of *C. colocynthis* purgative and emetic. Outer utilization of its leaf is utilized for aggravation and bleeding.

The root is a powerful remedy for scorpion and snail bites (Heravi, 1992).

***Cannabis sativa* Linn** - *Cannabis sativa* (Hemp or bhang, Cannabaceae) is one of the most important industrial crops distributed at the global level (Zhang et al., 2018) for its psychoactive resins. The native distribution of the species is in Central Asia, Siberia, China and the Himalayas. *C. sativa* contains more than 400 active compounds, but the major psychoactive toxic constituents are 9-tetrahydrocannabinol (THC) and cannabidiol (CBD). The lethal dose or LD50 of THC is not determined in humans, but in cattle, it was observed to be 40 to 130 mg/kg bodyweight (Breijyeh, Jubeh, Bufo, Karaman, & Scranio, 2021).

**Table 1. Some other poisonous plants in India are listed here-**

S.No.	Plant Species	Family	Toxic Compound	Symptoms	Reference
1.	<i>Abrus precatorius</i> Linn	Fabaceae	Abrin	In humans, it causes vomiting, nausea, difficulty in swallowing, throat pain, high fever, weakness, irritation in the eyes, severe diarrhoea and even death.	(H. Bhatia, R. Manhas, K. Kumar, & R. Magotra, 2014a)
2.	<i>Aloe vera</i>	Xanthorrhoeaceae	Aloin or barbaloin an anthraquinone glycoside	Excessive consumption may cause nausea, abdominal pain, vomiting and cardiac dysrhythmias.	(Jamloki et al., 2022)
3.	<i>Atropa belladonna</i> Linn.	Solanaceae	Atropine and Scopolamine	Plant ingestion may cause vomiting, nausea and abdominal cramps.	(Jamloki et al., 2022)
4.	<i>Calotropis procera</i> (Aiton) W.T. Aiton	Asclepiadaceae	Uscharin, Calotoxin, Calotropin, Calactin	The milky latex of this plant act as the skin and mucous membranes irritant, which causes blisters in both humans and animals. Both the leaves and the latex cause diarrhoea in livestock and abortion of pregnant animals.	(Bhatia et al., 2014b)
5.	<i>Cannabis sativa</i> Linn.	Cannabaceae	Cannabidiol, 9-tetrahydrocannabinol (THC)	Skin allergy.	(Gupta, Manikyaprabhu, & Dwibedi, 2018)
6.	<i>Commelinab enghalensis</i> Linn	Commelinaceae	n-octacosanol, n triacontanol, n-dotriacontanol	stomach problems	(Bhatia et al., 2014b)

7.	<i>Argemone Mexicana</i> Linn.	Papaveraceae	Sanguinarine and dihydrosanguinarine	Seeds are toxic and cause nausea, intense headaches, vomiting, severe diarrhoea, oedema of the legs and feet.	(Shelar, Bafna, Wahile, & Tupkari, 2011)
8.	<i>Cuscuta reflexa</i> Roxb.	Cuscutaceae	Cuscutin, cuscutatin, beta-sitosterol, luteolin, bergenin and kaempferol	It causes vomiting, stomach ache, anorexia and purgation in animals, and its consumption can cause abortion in pregnant animals.	(Bhatia et al., 2014b)
9.	<i>Datura innoxia</i> Mill.	Solanaceae	Atropine	Contact with the leaves causes several skin problems. Unintentional consumption of these seeds by humans and animals causes dryness and sensation of the mouth and throat, stomach ache.	(Bhatia et al., 2014b)
10.	<i>Digitalis purpurea</i> Linn.	Plantaginaceae	Digitoxin and Digoxin	nausea, vomiting, abdominal pain, excessive urination, abnormal heartbeats and finally death.	(Jamloki et al., 2022)
11.	<i>Lantana camara</i> Linn.	Verbenaceae	Lantadenes	Jaundice, diarrhoea, weakness, lethargy, photosensitivity and hepatotoxicity in grazing animals.	(Negi et al., 2019)
12.	<i>Nerium indicum</i> Mill.	Apocynaceae	Oleandrin	increased blood pressure and heart rate, sweating and vomiting. Its excessive consumption leads to heart attack and sudden death.	(Bhatia et al., 2014b)
13.	<i>Ranunculus arvensis</i> Linn.	Ranunculaceae	Protoanemonin	Skin inflammation and injury of mucous membranes. The fresh leaf juice causes cracks, itching and sores in the skin of humans and animals.	(Sedivy, Piskorski, Müller, & Dorn, 2012)
14.	<i>Solanum xanthocarpum</i>	Solanaceae	Solasone and solamargine	Headaches, nausea, vomiting, diarrhoea, stomachache, burning of the throat, itching, eczema, thyroid problems and pain and inflammation in the joints.	(Siddiqui, Siddiqui, & Faizi, 2011)

7.	<i>Argemone Mexicana</i> Linn.	Papaveraceae	Sanguinarine and dihydrosanguinarine	Seeds are toxic and cause nausea, intense headaches, vomiting, severe diarrhoea, oedema of the legs and feet.	(Shelar, Bafna, Wahile, & Tupkari, 2011)
8.	<i>Cuscuta reflexa</i> Roxb.	Cuscutaceae	Cuscutin, cuscutatin, beta-sitosterol, luteolin, berberine and kaempferol	It causes vomiting, stomach ache, anorexia and purgation in animals, and its consumption can cause abortion in pregnant animals.	(Bhatia et al., 2014b)
9.	<i>Datura innoxia</i> Mill.	Solanaceae	Atropine	Contact with the leaves causes several skin problems. Unintentional consumption of these seeds by humans and animals causes dryness and sensation of the mouth and throat, stomach ache.	(Bhatia et al., 2014b)
10.	<i>Digitalis purpurea</i> Linn.	Plantaginaceae	Digitoxin and Digoxin	nausea, vomiting, abdominal pain, excessive urination, abnormal heartbeats and finally death.	(Jamloki et al., 2022)
11.	<i>Lantana camara</i> Linn.	Verbenaceae	Lantadenes	Jaundice, diarrhoea, weakness, lethargy, photosensitivity and hepatotoxicity in grazing animals.	(Negi et al., 2019)
12.	<i>Nerium indicum</i> Mill.	Apocynaceae	Oleandrin	increased blood pressure and heart rate, sweating and vomiting. Its excessive consumption leads to heart attack and sudden death.	(Bhatia et al., 2014b)
13.	<i>Ranunculus arvensis</i> Linn.	Ranunculaceae	Protoanemonin	Skin inflammation and injury of mucous membranes. The fresh leaf juice causes cracks, itching and sores in the skin of humans and animals.	(Sedivy, Piskorski, Müller, & Dorn, 2012)
14.	<i>Solanum xanthocarpum</i>	Solanaceae	Solasoinine and solamargine	Headaches, nausea, vomiting, diarrhoea, stomachache, burning of the throat, itching, eczema, thyroid problems and pain and inflammation in the joints.	(Siddiqui, Siddiqui, & Faizi, 2011)

15.	<i>Taxus baccata</i> Linn.	Taxaceae	Taxanes or Taxines, Taxol	Seeds and leaves are highly toxic, causing nausea, vomiting, abdominal pain, bradycardia and respiratory muscle paralysis	(Willaert, Claessens, Vankelecom, & Vanderheyden, 2002)
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In this review, we have described some poisonous plants found in India with their toxicity, toxic compounds and post-ingestion symptoms. This review will be helpful as a guide for researchers, the pharmaceutical industry and toxicological studies, and increase public knowledge and awareness about plant toxicity. We have discussed that the toxicity of a plant depends on the presence of several chemical compounds and their concentration, as well as on other factors, i.e., temperature, rainfall, age of plants, plant dosage, growth stage, time of collection and nutrients in the soil. Some plants are highly toxic, causing cardio- and neurotoxicity, increased heart rate, vomiting, abdominal cramps and diarrhoea, and ultimately death. On the other hand, some poisonous plants can cause mild symptoms, such as fever, skin allergies, headaches and weakness. We believe that further studies are needed towards a better understanding of the detailed mechanism of action of these poisonous plants, as well as their role in curing a variety of diseases.

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# Exotic Plants of Sagar Region

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## **Abstract :**

*Exotic plants introduced foreign, non-indigenous or non-native an exotic plant that has escaped from its original ecosystem and is reproducing on its own in the regional flora is considered a naturalized species. Humans have been transporting animals and plants from one part of the world to another from thousands of years. Total plant species found belonging to families. These plant are transfered by man and animals and now growing successfully in Sagar region.*

**Keywords :** Exotic plants, Indigenous Plant, Non-indegenous Plants.

## **Introduction :**

The exotic species is recognized as a primary cause of global biodiversity loss. These plants migrate by humans or animals and survive in new climatic condition. According to the convention for biological diversity, exotic plant species are the second largest cause of biodiversity loss in the world and impose high costs to agriculture, forestry and aquatic ecosystems. In fact introduced species are a greater threat to native biodiversity than pollution harvest and disease combined.

The global extent and rapid increase in exotic species is homogenizing the world's flora and fauna (Mooney and Hobbs, 2000) and is recognized as a primary cause of global biodiversity loss. Bio-invasion may be considered as a form of biological pollution and significant component on global change and one of the major causes of species extinction (Mooney and Drake, 1987, Drake et al., 1989).

Exotic species posses characteristic features like "Pioneer Species" in varied landscapes, tolerant of a wide range of soil and weather conditions, generalist in distribution, produces copious amount of seed that dispose easily, grows aggressive root systems, short generation time, high dispersal rates, long flowering and fruiting periods, broad native range abundant in native range. Preliminary data from one interesting study shows that exotic plants

species are likely to have relatively small amounts of DNA in their cell nuclei. Apparently the cells in these plants are able to divide and multiply more quickly and consequently the entire plant can grow more rapidly than species with higher cellular DNA content.

Present paper based on some exotic plants found in Sagar region and these plants migrate in this region from another region and survive successfully in this area.

### Material and Methods

The present study was carried out at selected area around Sagar. A survey has been done to find out exotic plants their occurrence and distributions. The plant was listed and briefly described for their vernacular names scientific names.

### List of Exotic Plant Species in Sagar Region

No.	Botanical Name	Family	Habit	Nativity
1.	<i>Ageratum conyzoides</i>	Asteraceae	Herb	Trop. America
2.	<i>Argemone mexicana</i>	Papaveraceae	Herb	South America
3.	<i>Cassia tora</i>	Caesalpiaceae	Herb	Tro-South America
4.	<i>Mimosa pudica</i>	Mimosaceae	Herb	Brazil
5.	<i>Mirabilis jalapa</i>	Hyctaginaceae	Herb	Peru
6.	<i>Ocimum americanum</i>	Lamiaceae	Herb	Tro. America
7.	<i>Oxalis corniculata</i>	Oxalidaceae	Herb	Europe
8.	<i>Sida acuta</i>	Malvaceae	Herb	Trop. America
9.	<i>Tribulus terrestris</i>	Zygophyllaceae	Herb	Trop. America
10.	<i>Tridax procumbens</i>	Asteraceae	Herb	Trop. Central America
11.	<i>Xanthium strumosium</i>	Asteraceae	Herb	Trop. America
12.	<i>Datura metal</i>	Solanaceae	Shrub	Trop. America
13.	<i>Ipomoea</i>	Convolvulaceae	Shrub	Trop. America
14.	<i>Lantana camara</i>	Verbenaceae	Shrub	Trop. America
15.	<i>Eucalypts globules</i>	Myrtaceae	Tree	Australia

### Result and Discussion

Total 15 plant species were collected during the study out of these 12 herbs, 03 shrub and 01 tree species were classified belong to 10 different families. Out of these 15 plant species, 11 migrate from America, 01 belong to Australia and other belongs to Peru,

Brazil and Europe. These plants were came here from different countries by the human activity.

While a number of lists of exotic plant species are in worldwide circulation, criteria used in these listings often are not documented. The exotic species are ready colonizers in disturbed area and caused considerable ecological damage to natural areas, speed the disappearance of threatened and endemic species, reduce the carrying capacity of pastures, increase the maintenance costs of crop lands, and interfere with our enjoyment of the outdoors. Some species may have invaded only a restricted region, but have a huge probability of expanding and causing great damage. Other species may already be globally widespread and causing cumulative but less visible damage (Reddy et al., 2008).

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# Sustainable Development

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## Abstract :

*The World Commission on Environment & Development (1987) "Development that meets the needs of present without compromising the ability of future generations to meet their own needs sustainability implies the ability of a production system to provide for the present without limiting future options. The concept relates to distribution of resources in time, in space, and among species, but is context dependent. Management of human use of the biosphere so that it may yield the greatest sustainable benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations.*

**Keywords :** Sustainable development, Resources Biosphere, Management of human use.

Since the emergence of the concept in the 1980s, the term "sustainable development" and sustainability have appeared in many great papers. Sustainable development has become a ubiquitous development paradigm. In the attempt to move beyond the sustainability rhetoric and pursue a more meaningful agenda for sustainable development, A clear definition of this concept and explanation of its key dimensions are needed. This research paper will thus include concise information on its meaning, Key concepts, dimensions, principles and the implications for global, national and individual actions in the quest for sustainable development.

## Sustainable Development:

It basically is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

## Importance:

- ◆ Conserves natural resources.
- ◆ Establish a balance between people and natural resources.
- ◆ Fulfills people's expectations.

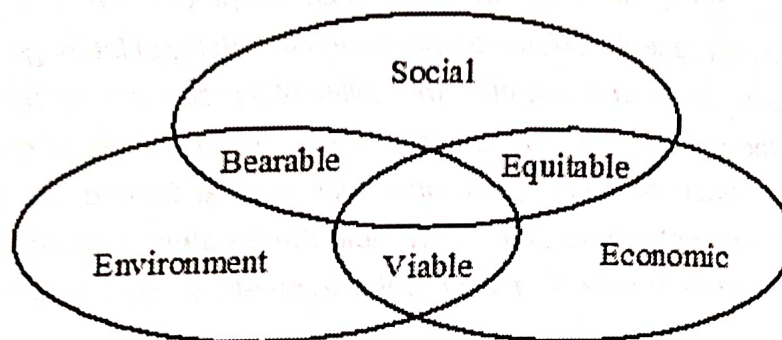
### Sustainability :

The difference between sustainable development and sustainability is that sustainability is often thought of as a long term goal while sustainable development refers to various processes and pathways to achieve it.

### Pillars of Sustainability :

Sustainability is made of three pillars that are:-

1. Environment
2. Economy
3. Society



### The Environmental Pillar:

This pillar gets the most attention. As companies these days are focusing on reducing their carbon foot prints, packaging waste, water usage to reduce the overall negative effect on the environment. Companies have found out working positively for planet have a positive financial impact as well.

### The Social Pillar:

The social pillar ties back into another poorly defined concept : Social license. A sustainable business should have the support and approval of its employees, stakeholders and the community it operates in. It includes aspects like:-

- ❖ Treating employees fairly
- ❖ Being a good community member.
- ❖ Retention and engagement strategies for employees.
- ❖ Fundraising, sponsorships, scholarships and investment in local public projects.

### The Economic Pillar:

The economic pillar of sustainability is where most businesses feel they are on

firm ground. To be sustainable, a business must be profitable. Activities that fit under the economic pillar include compliance, proper governance and risk management.

Goals of Sustainable Development:

The sustainable Development Goals also known as the Global Goals, were adopted by all United Nations Member States in 2015 so as to protect our people, planet and environment. The Goals are:

### **1. No Poverty**

Eradicating poverty in all forms remains one of the greatest challenges facing humanity. Though the number of people living in extreme poverty dropped between 1990-2019, too many are still struggling for basic human needs.

### **2. Zero Hunger**

The number of under nourished people has dropped by almost half in the past two decades because of rapid economic growth and increased agricultural productivity. Still some people are struggling for food. Extreme hunger and malnutrition remain a huge barrier to development in many countries.

### **3. Good Health & Well-Being**

By providing more efficient funding to health systems, improving sanitation and hygiene, increasing access to physicians and reducing ambient pollution, significant progress is expected to be made-saving the lives of millions.

### **4. Decent Work and Economic Growth**

As this current scene which we all are aware of which is recession and pandemic so this is the need of the hour that we need to create job opportunities for youth.

### **5. Give and Take Attitude**

Last but not the least, human beings need to build the attitude which is beyond their selfish needs, because everything we have is because of nature and resources so we owe everything to them, so human being should practice and try to return as much as they can to our mother earth.

### **Conclusion :**

As we know environmental management is most important yet it is the most neglected in our country.

Sustainable development is basically divided into three parameters which are

protecting environment and avoiding depletion of non-renewable resources, equity and the last is distribution of resources. This paper clearly discusses about the importance of sustainable development, pillars of sustainable development and goals of sustainable development.

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# POPULATION AND ENVIRONMENT

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Environment is the topic of common discussion these days the reason for this is the rapid deterioration occurring in the environment. The common problems that have come up in the environment include global warming, Ozone layer depletion, acid precipitation, pollution, extinction of species, soil erosion, etc. The common cause of these problems is the ever - increasing human population

## **POPULATION AND DEVELOPMENT :**

An increase in population of a country necessitates rapid development to provide basic amenities to people. Development involves establishment of new townships, industries; expansion and improvement of agriculture; modernization of transport, building up of dams and canals etc. Thus, all development projects need space. The space is usually made available by clearing forests and reclaiming the waste lands. Both the methods destroy the natural habitats of plants and animals. Habitat destruction has been the main cause of extinction of species. Some animals migrate to new habitats where they are likely to disturb the ecosystem balance.

The productive areas of grasslands, croplands and woodlands are fast reducing because of development projects. Modern industry and agriculture are polluting the life supporting systems - air, land and water by releasing harmful chemicals.

## **FACTORS RESPONSIBLE FOR POPULATION GROWTH :**

1. Decrease in death rates due to increased food production and control of diseases as a result of advancements in science and technology.
2. Increase in average life span.
3. Better medical facilities.
4. Control of insect nectars of fatal diseases and epidemics.
5. Better sanitation.

6. Proper care of new-born babies and their mothers.
7. Better nutrition and easy availability of basic amenities.
8. Protection against wild life and adverse weather as people live in houses.

### **EFFECTS OF OVERPOPULATION ON ENVIRONMENT :**

1. **Shortage of space** - New towns and cities are coming up to accommodate the growing population. This has put a great strain on agricultural land and forests. Clearing of forests for habitation and agriculture has caused new problems, including soil erosion, floods and increasing pollution.
2. **Energy Crisis** - Increase in population has created greater demands for energy. Growing consumption of fossil fuels (oil, gas, coal) and electricity can lead to the depletion of these resources. Rapid industrialization and urbanization have added to the problem.
3. **Eco-degradation** - Overpopulation causes eco-degradation in the following ways :-
  - (i) **Pollution** : Rise in population has caused pollution of air, water and land. This is also seriously affecting the human health.
  - (ii) **Sanitation** : It is difficult to maintain sanitation in crowded areas. This also leads to several diseases.

# Ashwagandha (*Withania somnifera* Linn): Therapeutic and Preventive Value, Immunomodulatory Effects And Battling Infections

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## Abstract :

Since ancient times, natural products have been used for the treatment of different type of diseases in several ways. The plant contains different type of phytoconstituents which showed different pharmacological activities. Ashwagandha (*Withania somnifera* (WS), a shrub known for its numerous therapeutic properties is also used as a antiviral herb for the treatment of several viral diseases. The major biochemical constituents of Ashwagandha root are alkaloids (isopellertierine, anferine), steroidal lactones (withanolides, withaferins), saponins containing an additional acyl group (sitoindoside VII and VIII), and withanolides with a glucose at carbon 27 (sitonidoside XI and X). The steroidal lactones (withanolides) obtained from its roots have been implicated in a wide range of therapeutic activities. It can reduce anxiety and stress, help fight depression, boost fertility and testosterone in men, and a memory enhancer. It helps in immunomodulation, anti-cancerous and anti-epileptic, diuretic, antiageing, anti-oxidant, hypoglycemic and rejuvenator. Ashwagandha enhances nitric oxide synthetase activity of the macrophages, which in turn increases the killing power of these immune cells thereby enhancing the Cell Mediated Immune response. Thus this plant is an important ingredient in many polyherbal preparations. Researchers from leading institutes in India are exploring the properties of the Ashwagandha on "therapeutic and preventive value" against COVID-19 infections.

**Keywords :** COVID-19, Withanolides, Cell mediated immunity, Withaferins.

## Introduction :

Ayurveda is a Sanskrit word, which means "the scripture for longevity". It represents an ancient system of traditional medicine prevalent in India and in several other south Asian countries. It is based on a holistic view of treatment which is believed to cure human diseases through establishment of equilibrium in the different elements of human life, the body, the mind, the intellect and the soul. Ashwagandha (*Withania somnifera*) is a well known herb possessing several health benefits and is an important 'Rasayana' as "Sattvic

"Kapha Rasayana" in Indian Ayurveda, used since centuries for its marvelous advantages (Mahima et al., 2012). Ashwagandha (*Withania somnifera*) is a traditional medicine with growing needs due to its remedial potentials. Chinese, Unani, Ayurveda and Siddha literatures admire the therapeutic merits of plant-derived medicines against almost all ailments. An esteemed Rishi (sage) Punarvasu Atriya was the first person who gave the teaching regarding the use of Ashwagandha that extends back over 3000 to 4000 years ago wherein its use is widely extolled as a tonic particularly for emaciation in all age group of people. This causes enhancement of the reproductive function of both men as well as women (Mathur and Velpandian, 2009; Verma and Kumar, 2011; Mahima et al., 2012; Dhama et al., 2013a). Ancient ayurvedic scriptures named this plant Ashwagandha which means 'odour of the horse' as its roots smell like horse's urine. It is also known as Ashwakandika, Ashgandh, Gandhapatri and Palashparni.

The present evaluation describes Ashwagandha (*W. somnifera*) and its active compounds, mechanism of action and biological activity and classical beneficial applications of Ashwagandha in biomedicine and veterinary sciences viz., immunomodulatory effects, activity against microbes and infection and usefulness as an alternative, chemotherapeutic agent, promoting vigour and vitality, strain reliever, antidepressant, anti-inflammatory and adaptogenic property, cardioprotectant, role in treating sexual disability, potent anti-cancer effects, anti-aging activities, memory enhancer, treating neurodegenerative disorders, anti-viral properties.

#### *Classification and Characteristics of Plant*

#### **1. Ashwagandha (*Withania somnifera* Linn)**

#### **2. Family-solanaceae/apocynaceae**

**3. Popular/common name:** Indian ginseng/winter cherry: Ashwagandha is an exceptionally important medicinal plant with valuable and wide therapeutic benefits in the alternative system of medicine. The plant grows in form of shrub with branching, height reaches to around 150 cm, leaves are up to 10 cm long; flowers present greenish or lurid yellow color, fruits/berries when mature are orange colored and its seeds are sown mostly during month of June or July (Khanna et al., 2006a; Dasgupta et al., 2008). Roots are 20-30 cm long and 6-12 mm in diameter, with few (2-3) lateral roots of slightly smaller size, straight and are unbranched. Outer surface is buff to grayish-yellow with longitudinal wrinkles and in the center soft, solid mass with scattered pores. It has a characteristic odor, taste bitter and is acrid. Whole plant, leaves, roots, stem, green berries, fruits, seeds and bark are used for therapeutic purpose, while roots are mostly utilized (Kirtikar et al 1991).

**Active constituents/compound/principle:** Withania somnifera has more than 50 active chemical constituents. Steroidal alkaloids and lactones (Withanolides, Withaferins): Anaferine alkaloid, anahygrine, isopelletierine, cuseohygrine, Ashwagandhanolide (dimeric thiowithanolide), chlorogenic acid, beta-Sisterol, fruit cysteine, iron, scopoletin, somniferinine, somniferiene, tropanol, withananine, withanoside IV, withanolides A-Y (Steroidal lactones) and saponins sitoindosides and acylsterylglucosides. The sitoindosides VII-X and withaferin-A are anti-stress agents which support immunomodulatory actions and have antifungal properties also (Abraham et al., 1975; Choudhary et al., 1995; Singh et al., 2006). Most of the pharmacological activities of Ashwaganda have been attributed to two main withanolides, withaferin A and withanolide D (Singh et al., 2010).

**Ethnopharmacological aspects :** The pharmacological as well as metabolic effects of ashwagandha reveal that it can be used both as herbal tonic as well as health supplements. In rats the swimming time is increased by Ashwagandha as determined by physical working capacity test (swimming endurance test). By performing such test it has been found that the weight of the heart increases relatively and the content of glycogen in myocardium increased significantly (Dhuley, 2000).

Two major classes of compounds viz., steroidal lactones and steroidal alkaloids are accountable for the wide range of useful effects of Ashwagandha. Withanolides are a class of compound included in the group of steroidal lactones and are responsible for antioxidant properties as well as free radical scavenging activities. Till date several alkaloids, withanosides and withanolides have been studied. Several studies have also revealed the antimicrobial properties of ashwagandha along with antibacterial activity against potentially dangerous like Salmonella (food poisoning causing organism). The ability of macrophage and immune cells to eat pathogens is enhanced by the root extract of Ashwagandha in comparison to macrophages (in control group) that have not received ashwagandha (Davis and Kuttan, 2000b; Govindarajan et al., 2005; Owais et al., 2005).

**Mode of action :** Due to the property of helping in regulation of important physiologic processes Ashwagandha is assumed to be amphoteric. Withanolides act as important hormone precursor that has got the capability to convert into human physiologic hormones. According to some hypothesis, the plant-based hormone precursor occupies the receptor sites in the cell membrane thereby preventing the attachment and subsequent exertion of the effect of actual hormone. Some effect is exerted by the plant-based hormone if the level of native hormone is low (Misra, 2004). The anti-stress effect of ashwagandha was due to stimulation of respiratory function causing relaxation of smooth muscle along with stimulation of thyroid synthesis and secretion. Increase in dopamine receptors in the

corpus callosum of brain induced by stress is suppressed by ashwagandha. Stress-induced increase in corticosterone in plasma along with blood urea nitrogen as well as blood nitric acid is also reduced.

**Bio-chemistry of *Withania somnifera* :** Withanolide obtained from the roots of *W. somnifera* possess anti-inflammatory and analgesic activity due to its cyclooxygenase-2 inhibition property (Nair and Jayaprakasam, 2007). Peroxidases enzyme have been purified from this herb. Withanolides I-III and IV-V isolated from *W. somnifera* inhibited cholinesterase, acetylcholinesterase and butyrylcholinesterase, toxic phospholipase enzymes and therefore, are under consideration to be among the potent therapeutic candidate for treatment of Alzheimer's disease (Choudhary et al., 2004, 2005; Johri et al., 2005; Kambizi et al., 2006). Important constituent withanolides, withanosides can be isolated and purified by various techniques mainly by Ultra High Performance Liquid Chromatography (UHPLC) and spectrometry.

**Immunomodulatory Effects:** Immune system provides protection from invading pathogens and various cancers. The regulation of the immune system has been a major challenge for the management of autoimmune disorders, tumor immunity, infectious diseases and organ transplants. The immunomodulatory properties of *Withania somnifera* are well known and have been used in the formulations of 'rasayana', which makes the body resistant to diseases without any side effects. Trivedi et al (2017) studied immunomodulatory properties of *W. somnifera* based formulations in Sprague Dawley rats. They found noteworthy increase in CD4+ and CD8+ T-Cell populations in rats. In addition the concentrations of IgM and IgG antibodies were also improved. Besides, other supportive parameters like antioxidant profile and hematology was also improved.

A glycoprotein Glycowithanolides, commonly known as *Withania somnifera* glycoprotein (WSG), 28 kDa isolated from the *W. somnifera* root has demonstrated potent antimicrobial activity against the pathogenic fungi and bacteria. WSG protein shows fungicidal activity by inhibiting fungal spore germination and reduction of hyphal growth of *Fusarium oxysporum*, *F. verticilloides* and *Aspergillus flavus*. Antibacterial effect has also been seen against *Clavibacter michiganensis* subsp. *Michiganensis* bacteria. In vitro antibacterial property of *Withania* plant in laboratory plant cell culture is also on hand. These findings persuade further studies to explore wide horizons of WSG as a budding therapeutic agent against various fungi and bacteria (Girish et al., 2006; Jamil et al., 2007;).

**Anti-Viral Properties :-** Some study highlights the importance of natural origin phytochemicals in controlling COVID-19 entry into host cells, and provides an attractive and alternative means for the management of COVID-19 infection. *W. somnifera* could

will be the first choice of ayurvedic medicine in these directions, to control the COVID-19 infections. Studies done by Cai et al (2015) demonstrated that Withaferin-A (WA) has the potential to attenuate the neuraminidase (NA) of H1N1 influenza. Their docking and simulation results predicted high binding affinity of the WA toward NA and revealed several interesting molecular interactions with the residues which are catalytically important during molecular dynamic simulations. Many studies have revealed that withaferin A is a potential ligand to target/inhibit DNA polymerase of the Herpes simplex virus, thus can be used to develop potential drug against Herpes (Grover et al 2011).

**Anti-inflammatory effects:** In Ayurveda, Ashwagandha is considered as an anti-inflammatory herb traditionally used for the treatment of arthritis and asthma. The inflammatory response is a complex cascade of steps that include an activation of white blood cells and the production and release of inflammatory mediators. Ashwagandha reported to possess anti-inflammatory property in different pharmacological animal models of inflammation such as carrageenan-induced inflammation, cotton pellet granuloma and adjuvant-induced arthritis. It inhibited the granuloma formation in cotton-pellet implantation in rats similar to that of hydrocortisone sodium succinate (Uddin et al., 2012; Hindawi et al 1986; Hindawi et al 1992).

**Anti-cancer effects:** Studies reveals that *W. somnifera* can be used as synergizer to support conventional chemotherapy or radiation therapy due to its long term tumor growth inhibition property. Anti-carcinogenic effects are mainly on account of decreased expression of nuclear factor-kappa-B, suppression of intercellular Tumor Necrosis Factor (TNF) and potentiation of apoptotic signaling in cancerous cells of animals or cell lines (Singh et al., 2010; Dhama et al., 2013e).

**Role against neurodegenerative disorders or Neuroprotective Effects:** Neurodegeneration is the progressive loss of structure or function of neurons, including death of neurons. Parkinson's, Alzheimer's and Huntington's diseases occur as a result of neuro-degenerative processes. Researchers found that ashwagandha can support the growth of nerve cell dendrites, which allow these cells to receive communications from other cells. Thus ashwagandha can heal the brain tissue changes that accompany dementia and also promote the growth of both normal and damaged nerve cells, suggesting that the herb may boost up healthy brain cell function as well as benefit diseased nerve cells

## CONCLUSION

The uses of ayurvedic medicines continue to grow in Covid-19 period with the expansion of modern medicine. The wonder herb *W. somnifera* (Ashwagandha) potentiates the immune functions, enhances the longevity and facilitates the restoration of homeostasis

by reducing the stress. Withaferin A (WA), an active constituent of *Withania somnifera* has been shown to have a broad range anti-viral activity with little or no side effects. The trusted reputation of Ashwagandha as an immunity enhancer forms the basis of researches for developing drugs for combating novel Coronavirus infections. Because of its wide pharmacological activities, Ashwagandha is considered as an important component of various polyherbal preparations. Thus the plant has got immense practical applicability in biomedicine as well as veterinary medicine focusing its potent role in the maintenance of sound health.

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# Biology And Population Density of Tobacco Cutworm *Spodoptera litura*- Pest of Soybean in Sagar (MP)

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## Abstract -

The biology and population density of *Spodoptera litura* was studied both under field and laboratory conditions. *S. litura* is serious pest of soybean their biology, population density and damage were studied in the field of village of Dhana Indian environment is favourable for all possible crops. A large number of insect species adapted to feed over a variety of plants and animals ruthlessly causing a severe damage to our economy and even to the livestock and public health India is the largest producer of pulses in the world both in quality and variety soybean is most important crop of India.

**Key words-** pest soybean, *Spodoptera litura*

## Introduction -

Tobacco caterpillar *Spodoptera litura* was reported for the first time in 1775 by lever (1943).<sup>4</sup> This pest is a serious pest of many crops including tobacco, potato, soybean, wheat gram lentil etc the caterpillars of the pest appear in large number and severely defoliated the crop. A part from feeding on the leaves the pest also attack their crops as cutworm in Madhya Pradesh the pest severely defoliated soybean in 1977-78 and reduced again yields by 20 To 30 percent. At Jabalpur M.P, the cutworm damage in gram was 61 % amounting to a loss of Rs 5100/- ha. Dubey (1986) the pest belong to order : lepidoptera family noctuidae, Dudgeon (1913). Dhariwal et al 2004 reported that insect pest have been a major constraint in agriculture production. In spite of all the advances made in crop protection technology losses caused by insect pest have increased with modernization of agriculture. There studies were under taken with the objective to study the life cycle, population density and nature of damage caused by s.

litura in Dhana, Sagar M.P. The present paper describes the biology and population density of *Spodoptera litura* when studied under field and laboratory conditions. Temperature and humidity were also taken into account.

#### **Material and Methods -**

The eggs and larvae were collected from experimental site of village Dhana in Sagar district. This site is situated 19 km east from Dr. H.S. Gour Central University Sagar (M.P). The larvae of *S. litura* were high during August 25th to September. 8th when the temperature range between 22 to 29.20C and relative humidity was 83% . The damage by maggots was 40-60% eggs and larvae were kept in glass jars covered with muslin cloth and reared in the laboratory and larvae were fed on soyabean leaves and seeds. Adults were fed with glucose soaked in cotton.

#### **Result and Discussion -**

The present study was undertaken to investigate the population density and biology of pest of soybean *Spodoptera litura* from seedling stage up to harvesting. However data shown were from the appearance of the pest till their disappearance. The temperature and the humidity were also taken into account during the study period.

In 2012-2013 the pest was found on the crop from August 06 to September 25. Pest population ranged from 9 to 33 larvae/100 plants. Highest pest population was recorded from August 23 to September 08 when the average of maximum , Minimum temperature and relative humidity were 29.20C and 83 percent respectively. Tobacco caterpillar infested soybean crop right from preflowering stage by damaging the leaves its appearance was distinctly marked when it started feeding leaves flowers and pods. During 2013 the percentage of eggs larvae and adults was 59% ,37% and 4% respectively (fig1.2)

**Biology eggs-** Eggs were laid in branches of 50 to 400 eggs on soyabean leaves. The female moth covers the egg masses with brown hairs giving them a "Felt like" appearance. Incubation period was 3 to 5 days (fig.)

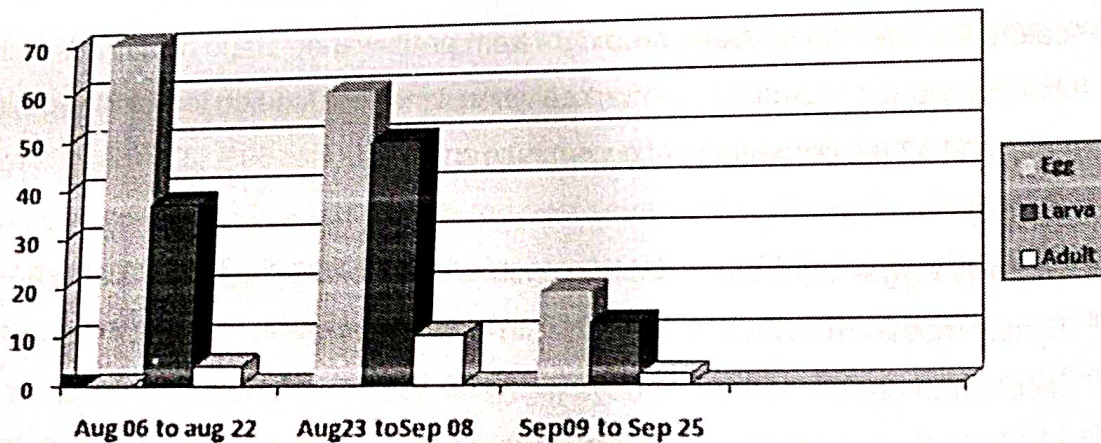
**Larva -** soon after hatching the newly hatched larvae were very active their length was about 01mm. The young caterpillars were very smooth skinned with patter red yellow and green liner and with a caterpillar feed gregariously on tender leaves by nibbing the

green matter. The larva measure about 35 to 40mm. Larval period lasts for 14 to 20 days  
**Pupa-** pupation takes place inside the folded leaves and a silky cocoon is formed. Pupal period ranged from 8 to 12 days.

**Adult-** The life span of adults ranged from 30 to 35 days. Adults female is generally bigger in size than the male.

Thus the present study of population density and biology of *Spodoptera litura* pests of soyabean in Sagar M.P was identified and noticed that it was a major foliage feeder of soyabean . In confirmation with the present findings Basu(1954) Gangrade (1974) Bhattacharya and Rathore (1977) David et al (1988) , Babu (2015) and Claude (2019) have also reported that female moth laid eggs in a mass on the surface of the leaves, however the incubation period is variable and it is directly related to environmental conditions, usually it ranged from 02 to 13 days . While in the present findings the incubation period ranged from 03 to 05 days. Eggs to adult life cycle was completed in 30 to 35 days while other authors showed that the life cycle was completed in 30 to 37 days. The present data indicates very helpful in controlling the population of the pest without the use of hazardous pesticides .

**Fig.01 Histogram showing population density of eggs, larvae and adults of *spodopteralitura* on Soyabean Population per 100 Plants**



**Fig.3: Photograph showing eggs of *Spodoptera litura* on soyabean**

leaves

FIG. 2 Pie diadram showing percentage of eggs,larvae and adults of *spodoptera litura*

■ Egg 59% ■ Larvae 37% ■ Adults 4%

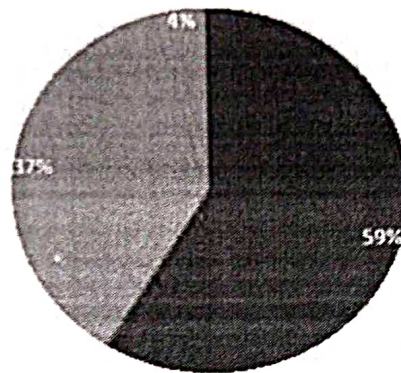
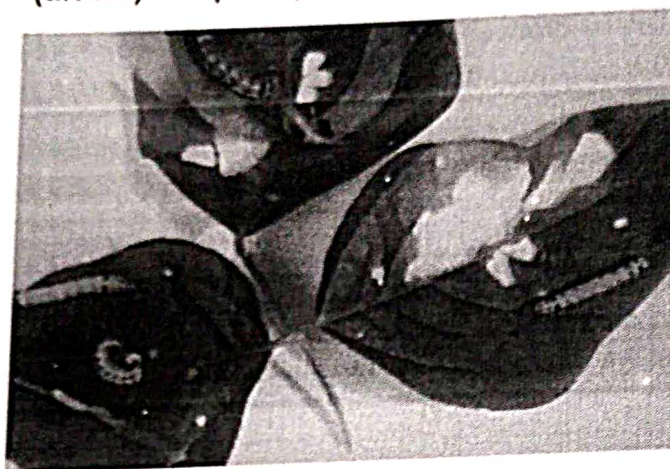


Fig.4: Photograph showing different larval instars of Spodoteralitura on soyabea



Fig.5: Photograph showing adult male (arrow1) and adult female

(arrow) of *Spodoptera litura* on soyabean



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# Accumulation of Malathion in some Tissues of *Heteropneustes Fossilis* (Ham.) as Assessed by Thin Layer Chromatography

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## Abstract -

*This paper presents the qualitative detection of malathion in the liver, kidney, testes, ovary, brain and gills of the fresh water teleost, Heteropneustes fossilis by thin layer chromatography. Study was made after exposure of fish to a sublethal concentration of 60 ppm for 30 days. Malathion breaks down sequentially to three detectable metabolites. Malathion metabolites brings about internal metabolic disturbances and histopathological changes in these organs. The results indicate an accumulation of malathion in these organs.*

**Key words** - Thin layer Chromatography, Malathion Fish.

## Introduction -

Although the chemistry and metabolism of malathion in various substances have been studied extensively (O' Brien 1967, Richard 1970, Post and Leasure 1974, Cook and Moore 1976), practically no residue data has been reported for malathion in fish tissues. Malathion, an organophosphorus insecticide a major lethal poison which is widely used because of its efficiency and also less persistence in the aquatic environment. The present research paper deals with the identification of malathion residues in different tissues of the fresh water teleost *Heteropneustes fossilis* (HAM.) by thin layer chromatography and the main aim of the study has been to get information on distribution of malathion residues in fish organs. (Dubale and Shah, 1979; Pandey and Shukla, 1982; Singh and Sahai, 1986a; Shrivastava and Shrivastava 1984; Fulton and Key, 2001 and Rico and Waichman 2011)

**Materials and Methods** - Live specimens of *H. fossilis* were obtained from the local Sagar lake. Fish weighing 14 to 16g and 12 to 14 cm in length were used. They were acclimatized in the laboratory for a week before the experiment. The method of application of the pesticide and the bioassay used are the same as described by Singh and Sahai. (1984b). For thin layer chromatography the method of Walker and Beroza (1963) was used. Ten fish were taken each time at 96 h, 15 days and 30 days after exposure to malathion at a concentration of 6 ppm. Rf values of the spot were then calculated by the formula:

$$R_f = \frac{\text{Distance of Spot Centre From Start Point}}{\text{Distance of Solvent Front From Start Point}}$$

**Results and Discussion** - The results of qualitative determination of malathion residues in different tissues studied using solvent systems is given in chromatogram 1, 2 and 3

Chromatogram	- 1
Layer - Silica gel	- G
Solvent - Hexane : Acetone	- (80:20)
Solvent front	- 14 C.M.
Spray reagent	- Palladium Chloride
Time	- 50 Minutes

Days of exposure	Colour of the spot	Rf					
		Gill	Liver	Kidney	Testes	Ovary	Brain
96 h	Yellow	ND	0.37	0.33	ND	ND	0.32
15 Days	Yellow	0.38	0.39	0.36	0.32	0.33	0.36
	Bright yellow	0.84	0.83	0.85	0.64	0.82	0.64
	Faint yellow	ND	0.92	ND	ND	ND	0.82
30 Days	Yellow	0.38	0.39	0.32	0.33	0.36	0.33
	Bright yellow	0.84	0.86	0.80	0.64	0.83	0.63
	Faint yellow	ND	0.95	ND	ND	ND	0.85

Chromatogram	- 2
Layer - Silica gel	- G



Solvent Chloroform : Methanol - (90:10)  
 Solvent front - 18 C.M.  
 Spray reagent - Palladium Chloride  
 Time - 30 Minutes

96 h	Yellow	ND	0.35	0.37	ND	ND	0.35
15 Days	Yellow	0.38	0.36	0.38	0.37	0.37	0.35
	Brownish yellow	0.60	0.65	0.65	ND	0.60	0.62
30 Days	Yellow	0.39	0.35	0.37	0.37	0.38	0.35
	Yellow	0.65	0.66	0.65	0.88	0.65	0.66
	Brownish yellow	0.89	ND	ND	ND	ND	0.88

Chromatogram - 3  
 Layer - Silica gel - G  
 Solvent Chloroform : Methanol - (90:10)  
 Solvent front - 15 C.M.  
 Spray reagent - Palladium Chloride  
 Time - 30 Minutes

96 h	Yellow	ND	ND	ND	ND	ND	0.26
15 Days	Yellow	0.55	0.28	0.28	0.28	0.28	0.268
	Faint yellow	ND	0.56	0.55	0.54	0.56	0.56
30 Days	Yellow	0.55	0.28	0.28	0.27	0.28	0.29
	Yellow	0.80	0.55	0.55	0.54	0.56	0.55
	Faint yellow	ND	0.79	ND	ND	ND	0.77

ND - Not detectable

Malathion gives yellow, bright yellow, faint yellow or brownish yellow spots on the TLC plates depending on the solvent system used. Significant difference in the values of the different spots were observed.

With all the solvent systems used after 96h only one spot is visible in the liver, kidney and brain. This spot is not detectable in the gills and gonads. On 15 days exposure normally two spots are visible with varying Rf's in all the tissues. However the third faint

yellow spot appeared only in the TLB of liver, kidney and brain with the Hexane : Acetone solvent system. On 30 days exposure three distinct spots are visible in all the tissue chromatograms except in the Chloroform : Methanol solvent system where the third spot is not detectable in the chromatograms of the gonads and gills. This suggests that the residue in fish tissues vary greatly from organ to organ. It also shows that malathion breaks down sequentially to three detectable metabolites. Tissue samples indicate high residue concentration in liver, brain and kidney in the descending order.

Bhagwat and Ramchandran (1975) reported malathion A and B esterases in the liver of mouse. Nomeir and Douterman (1978) also found degradation of malathion in the liver of mouse. Manzie (1980) has studied the presence of five metabolites of malathion, viz. malathion monocarboxylic acid (MCA), malathion dicarboxylic and (DCA), dimethyl phosphorothioate (DMTP), dimethyl phosphorodithioate (DMDTP) and dimethyl phosphoric (DMP). Cooke et al. (1976) have reported that whole body analysis of pin fish (*Lagodon rhoboides*) exposed to malathion showed the presence of malathion mono and dicarboxylic acids, other metabolites were not detected. Cooke et al. (1976) have however shown that malathion is also rapidly absorbed in fish tissues.

In the present study TLC analysis shows that in the different tissues of heteropneustes fossilis breaks up into three metabolites after 30 days exposure but after 15 days exposure two metabolites were present. However, with Hexane : Acetone which gave the best separation three metabolites were present even at 15 days exposure.

Knowledge of the location of pesticides in various tissues is important for understanding the route detoxification and degradation. The result of the present study shows that malathion breaks up into metabolites in the various tissues of clarias and consequently brings about internal metabolic disturbances and histopathological defects in these organs.

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# Environmental Pollution by Heavy Metal and Its Impacts in Human Life

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## Abstract -

*Environment can be referred to the surroundings within which human exist. Environmental pollution by heavy metals has become a global issue in the recent years as it affects public health. Heavy metals constitute a very heterogenous group of elements widely varied in their chemical properties and biological functions. Heavy metals are released into the environment in the form of flue gas or slag due to the combustion of some heavy metals-bearing fuels and migrated among the atmosphere, water and soil, causing various environmental pollution, such as fossil fuels (like coal), heavy oil, leaded gasoline, garbage power generation, etc. Contamination of aquatic and terrestrial ecosystems with toxic heavy metals is an environmental problem of public health concern. This article comprehensively reviews the different aspects of heavy metals as hazardous materials with special focus on their environmental persistence, toxicity for human life and bioaccumulative potential. Dietary intake of many heavy metals through consumption of plants has long term detrimental effects on human health. Metal pollution has harmful effect on biological systems and does not undergo biodegradation. This article will serve as a valuable educational resource for both undergraduate and graduate students and for researchers in environmental sciences.*

**Keywords -** Environment, heavy metals, biodegradation, fossil fuels, health

## Introduction -

The environment is the surroundings where humans, plants, animals and micro-organisms live or work. It is composed of the land, the Earth's atmosphere and the water. Environmental contaminants, as well as pollutants, are chemicals that are present at higher levels than in any section of the environment<sup>1, 2</sup>. The environment has been

seriously polluted by several pollutants such as inorganic ions, organic pollutants, organometallic compounds, radioactive isotopes, gaseous pollutants and nanoparticles<sup>2</sup>. Heavy metals (HMs) are natural constituents of the earth crust and biologically important at trace levels<sup>3</sup>. Heavy metal pollution is one of the greatest consequences of industrializations<sup>4</sup>. The environmental issues related to heavy metals contamination are becoming serious in developing countries due to increase in geologic and anthropogenic activities. These activities increased the concentration of these elements to amount that are harmful to the environment<sup>5</sup>. Heavy metal contaminants can easily impact people residing within the vicinity of the source via suspended dust or direct contact<sup>6</sup>. Environmental pollution by heavy metals has become a global issue in the recent years as it affects public health. Especially with the continue increase in anthropogenic activities such as industries and urbanization which releases pollutants in to the environment without control and effects remedies<sup>7</sup>.

A list of heavy metals according to their density of being greater than 5 g/cm<sup>3</sup> and which are more common in our everyday life are:

- Titanium
- Vanadium
- Chromium
- Manganese
- Iron
- Cobalt
- Nickel
- Copper
- Zinc
- Arsenic
- Molybdenum
- Silver
- Cadmium
- Tin

- Platinum
- Gold
- Mercury
- Lead

#### Heavy Metal -

Heavy metals are chemical elements with a specific gravity that is at least four to five times the specific gravity of water at the same temperature and pressure<sup>8</sup>. Heavy metals are metals or metalloids<sup>9</sup>. Metals have been widely used in agriculture, industry, medicine and other sectors, to the effect that they have been dispersed into the environment including our atmosphere, waters and soils<sup>10, 11</sup>.

#### Heavy Metal Pollution -

Pollutants may enter the ecosystem in various ways and will enter into the hydrosphere, lithosphere and atmosphere. The problem of environmental pollution due to toxic metals is of major concern in most major metropolitan cities. Heavy metals plays an important role as its concentrations in air, soil and water are continuously increasing due to anthropogenic activities<sup>12</sup>. Air pollution has long been recognized as a lethal form of pollution. Heavy metal mobilization in the biosphere by human activities has become an important process in the geochemical cycling of these metals<sup>13</sup>.

Soil contamination by heavy metals is of most important apprehension throughout the industrialized world<sup>14</sup>. Heavy metals are the main group of inorganic contaminants and a considerable large area of land is contaminated with them due to use of sludge or municipal compost, pesticides, fertilizers, and emissions from municipal wastes incinerates, exudates, residues from metalliferous mines and smelting industries<sup>15</sup>. The mechanism and path of the formation of pyromorphite from heavy metal lead in soil are mainly elaborated<sup>16</sup>. The concentrations of the HMs in the soil were found to be vary significantly with the seasons (winter, spring, summer, and autumn)<sup>17</sup>.

Water pollution can be defined in many ways. All metals are toxic at higher concentrations and their presence in water lead to water pollution<sup>18</sup>. Heavy metals are highly persistent, toxic in trace amounts, and can potentially induce severe oxidative stress in aquatic organisms<sup>19</sup>.

### **Effects of Heavy Metal on Human life -**

Excess of metal pollutants deposited on soils may be transformed and transported to vegetation and from plants they pass on to animals and human being. Heavy metal exposure to human occurs through three primary routes namely inhalation, ingestion and skin absorption<sup>20</sup>. Uptake of heavy metals by plants and subsequent accumulation along the food chain is a potential threat to animal and human health<sup>21</sup>. Heavy metals become toxic when they are not metabolized by the body and accumulate in the soft tissues<sup>22</sup>. HMs leads to the environment's ability to foster life being reduced as human, animal, and plant health become threatened<sup>23</sup>. Water pollution by heavy metals has many human origins, such as the burning of fossil fuels, exhaust gases of vehicles, mining, agriculture, and incineration of solid and liquid wastes<sup>24</sup>. Chronic level ingestion of toxic metals has undesirable impacts on humans and the associated harmful impacts become perceptible only after several years of exposure<sup>25</sup>. Various microorganisms have been reported as efficient candidates for bioremediation of heavy metals through natural attenuation either by bioaccumulation, biotransformation or biosorption<sup>26</sup>. The geoaccumulation index values showed a moderately polluted soil with Pb and Zn, but most contributing to the ecological risk were Cd with 63% and Hg with 19%<sup>27</sup>.

### **Conclusion -**

The problem of environmental pollution due to toxic metals is of major concern in most major metropolitan cities. Pollution of the natural environment by heavy metal is a worldwide problem because these metals are indestructible and most of them have toxic effects on living organisms and plants, when they exceed a certain concentration. Heavy metals uptake by plants and successive accumulation in human tissues and biomagnifications through the food chain causes both human health and environment concerns. This review highlights some significant concerns regarding human health associated with heavy metals.

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